Performance measurement and management within construction firms in Saint Lucia

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Dedication

I dedicate this PhD research thesis to the following:

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Abbreviations

BIM	Building Information Model
BSC	Balanced Scorecard
BM	Benchmarking
CPMM	Contemporary Performance measurement and management
CSF	Critical Success Factor
CEO	Chief Executive Officer
EFQM	European Foundation of Quality Management
Env. & com.	Environmental & community
GDP	Gross Domestic Product
GOSL	Government of Saint Lucia
HRM	Human resource management
IMF	International Monetary Fund
ICT	Information and Communication Technology
IT	Information Technology
KMO	Kaiser-Meyer-Olkin
KPI	Key Performance Indicator
MBNQA	Malcolm Baldrige National Quality Award
RDF	Results and Determinants Framework
R&D	Research and Development
PCA	Principal Component Analysis
PE	Performance Evaluation
PM	Performance measurement
PMM	Performance measurement and management
QDA	Qualitative Data Analysis
QM	Quality Management
TQM	Total Quality Management
SBU	Strategic Business Unit
SD	Standard deviation
SPSS	Statistical Package for Social Sciences

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Abstract

The dynamic and competitive business environment has motivated and compelled construction firms to implement contemporary performance measurement and management (CPMM) systems and frameworks to generate comprehensive information on their performance, and for benchmarking. The information from the CPMM framework is essential for the effective management of construction firms. The aim of this study, therefore, is to investigate performance measurement and management (PMM) within construction firms in Saint Lucia to develop a PMM conceptual framework to better measure and evaluate their business performance.

The methodology of this research is based on a comprehensive literature review of PMM in general, and in construction, questionnaire survey and case study. The literature review identifies key variables of PMM, in particular the salient components of the proposed conceptual framework. The questionnaire survey was conducted among 47 construction firms in Saint Lucia to gather the quantitative data. The study uses a multi-case study of two Saint Lucian construction firms involving semi-structured interviews and document analysis to gather the qualitative data. The quantitative data were analysed using descriptive statistics analysis and factorial analysis, whilst qualitative data were analysed using thematic analysis. Furthermore, the study applies structures and semi-structured interviews for the validation of the framework.

One of the main findings emerging from this study is the development of a conceptual framework, based on the Balanced Scorecard for construction firms to evaluate and manage their performance. The proposed framework contains both financial and non-financial performance measures used by Saint Lucian construction firms. Moreover, the findings reveal that Saint Lucian construction firms are using their performance measures for many different purposes such as measuring and monitoring performance, strategy management and managing risk. Furthermore, the findings provide considerable insight into the barriers to the implementation of a CPMM framework within construction firms. Having identify the barriers, the study further identifies key strategies to overcome the barriers to the successful implementation of a CPMM framework.

To date, there are few studies investigating the practices of PMM in developing countries like Saint Lucia. This exploratory study contributes to filling this gap through the development of the conceptual framework for Saint Lucian construction firms to better measuring and evaluating their performance. The Study further provides a systematic understanding of the importance of PMM practice in construction firms within the context of Saint Lucia.

Key words: critical success factors, construction firm, conceptual framework, performance measurement and management, performance measures, Saint Lucia.

Chapter 1 Introduction

This Chapter provides the background of the study by presenting an overview of performance measurement and management (PMM) in general and in particular in the construction industry. Additionally, it articulates the research problem, identifies the research gap, and provides the justification for this study. The research aim, objectives and questions were formulated to narrow the identified research gap. A brief summary of the research methodology adopted, the scope of the study and the structure of the thesis are presented in this chapter.

1.1. Research background

Business organizations in both developed and developing countries are operating in a rapidly changing and highly competitive business environment, which impacts on their strategies and PMM systems and frameworks. Globalisation, changes in customer demands, increasing competition and advances in information and communication technology are some of the most important trends and environmental factors in recent years that have influenced the adoption and effectiveness of the PMM within business organizations (Pedersen and Sudzina, 2012; Yadav-Sushil and Sagar, 2015). These key environmental factors have caused business organizations to constantly modify or revise their strategies and PMM systems/frameworks in order to reflect the changing circumstances and achieve their objectives (Munir and Baird, 2016; Pekkola, Saunila and Rantanen, 2016).

Over the past three decades, the evolution of the business environment has triggered a performance measurement (PM) revolution (Neely, 1999). The PM revolution has led to a change in main three foci in management practices. Firstly, a shift in focus from traditional PM systems/frameworks relying solely on financial measures to contemporary performance measurement and management (CPMM) systems/frameworks using both financial and non-financial measures to assessing business performance (Behery, Jabeen and Parakandi, 2014); Secondly, a shift in focus from merely measurement and control towards performance measurement and management (PMM) for measuring and managing business performance (Yadav-Sushil and Sagar, 2013); Finally, a move from merely concentrating on the interest of shareholders to focusing on the interest all stakeholders (Yadav-Sushil and Sagar, 2013). Consequently, numerous CPMM systems/frameworks such as the Balanced Scorecard (BSC) were developed and diffused over the

years to evaluate the performance of business organizations (Baird, 2017; Micheli and Mura, 2017). These CPMM frameworks incorporate both financial and non-financial performance measures that describe the objectives of an organization and encourage coherent behaviours throughout the organization (Silvi, Bartolini, Raffoni and Visani, 2015).

It is recognized that the need for and the importance of CPMM is increasing in today's changing business environment to meet a wide range of organizational objectives (Baird, 2017; Ha et al., 2017; Yuliansyah, Gurd and Mohamed, 2017). PMM is critical to the success of any organization because it influences organizational strategy (Moullin, 2017; Micheli and Mura, 2017; Yuliansyah et al., 2017) and therefore facilitates organizational performance improvement (Gomes and Yasin, 2013; Yuliansyah et al., 2017). It translates an organization's mission and strategy into goals, objectives, comprehensive set of key performance measures, targets and initiatives (Moullin, 2017; Sainaghi, Phillips and Zavarrone, 2017). Many prior studies (Pavlov and Bourne, 2011; Smulowitz, 2015; Yaghoobi and Haddadi, 2016; Sainaghi et al., 2017) suggest that PMM helps organizations to measure and evaluate their performance. Along the same line, PMM helps organizations to measure and evaluate progress in achieving continuous innovation (Saunila, 2017), and improves organizational competitiveness in the market (Gomes and Yasin, 2013; Oyewobi, Windapo and Rotimi, 2015). It provides a more holistic and balanced picture of the organization (Ferreira, Shamsuzzoha, Toscano and Cunha, 2012). Moreover, PMM provides a common language to cascade performance measures and relevant information throughout the organization (Busco, Giovannoni and Scapens, 2008), and to facilitate organizational learning (Dahlgaard, Chen, Jang, Banegas and Dahlgaard-Park, 2013).

PMM has been adopted in many different organizations (Choong, 2013a; Madsen and Stenheim, 2014; Akhtar and Mittal, 2015), and has been practiced in mostly all sectors of industry and commerce (Bititci, Garengo, Dörfler and Nudurupati, 2012; Deng and Smyth, 2013). Moreover, PMM plays an integral part in many different fundamental facets of management practices such as strategic management (Bititci et al., 2012); operations management (Bititci et al., 2012); performance management (Srimai, Radford and Wright, 2011; Hull, 2018) and risk management (Arena and Arnaboldi, 2014).

1.1.1 The construction industry and PMM

The construction industry/sector "covers business activities related to the planning and design of buildings and structures through to their construction and maintenance" (Constructionskills Insight, 2010, p.13). A wide array of business types are involved in the industry, which primarily fall under the categories of client, consulting and contracting organizations (Bassioni, 2004). Construction organizations can also be viewed from sector categorisation of public, private and mixed organizations. The construction industry is one of the largest in the world economy (McKinsey Global institute, 2017). More specifically, it plays a strategic role in every economy in the world and in the development of the built environment (UK Commission for Employment and Skills, UKCES 2012). The industry provides the infrastructure, buildings and other structures upon which all other sectors and industries of an economy depend. It has improved and continues to improve the standard of living of citizens in many countries.

The Overall construction output of the global construction industry is estimated at US$10.6 trillion in 2017, and is forecast to grow to US$12.7 trillion in 2022 (Global Data Construction intelligence Centre, 2018). According to McKinsey Global institute (2017), the global construction industry represents approximately 13 percent of global gross domestic products (GDP). Moreover, the global construction industry is highly labour intensive (Lim and Ofori, 2007) and employs about 7 percent of the working population of the world (McKinsey Global institute, 2017). It should be noted that the USA, China, Japan and Germany are among the largest constructions markets in the world (Garcia, 2011).

Whilst the global construction industry is vital to economic development and growth, it is dynamic and faces significant performance challenges and uncertainties that influence its overall performance. The key challenges of the global construction industry include:

1. Skilled labour shortages (Lim and Ofori, 2007; UKCES, 2012; Turner & Townsend, 2018);
2. Low/poor and declining productivity (Lim and Ofori, 2007; Turner & Townsend, 2017, 2018);
3. Increasing construction costs across the global which are reducing profit margins (Turner and Townsend, 2018);
4. Suboptimal performance or underperformance, in particular project delivery;

5. Client dissatisfaction with the products of the industry (Cartlidge, 2011).

Furthermore, the global construction industry is currently facing political and economic uncertainties as result of the following: Britain's ongoing complex Brexit negotiation with the European Union, the ongoing trade war between USA and Chania, and increasing political unrest in some countries with large construction markets such as Venezuela and Brazil. These uncertainties could erode business confidence and investment within the global construction industry.

The emerging trends in globalization, in the development of innovation and technology and urbanisation (Rider Levett Bucknall (RLB, 2018) have significantly influenced the global construction industry. In particular, firms in construction industry need understand how they can benefit from these global trends. Globalisation has brought changes to the methods of work, design, procurement and construction to achieve better project delivery. It also provides opportunities for investment and greater access to new construction markets across the globe. The trend of urbanization in both developed and developing countries will keep on increasing because the population in urban areas is continuing to rise and the growing need for smart and green cities. According to RLB (2018), urbanisation will be a significant driving force of global infrastructure spending over the next few decades. Construction technology and innovation provide the construction industry the catalyst for continuous improvement in business processes and practices, efficiency, productivity and ultimately enhance its competitiveness. However, globalization and developments in technology have led to increase competition and an increasing need for the development new skills and competencies within the construction industry. These global trends have challenged the status quo in the industry.

Furthermore, globalisation and technological innovation have provided innovative methods and solutions to address the aforementioned performance challenges in the construction industry in order to improve its performance. It can be argued that an improvement in performance of a country's construction industry would lead to an improvement in its overall economy. Therefore, it is imperative that construction firms within the industry measure their performance so that they

can know whether they have achieved improved performance and success. A CPMM framework as an innovative method or framework can be adopted to address the previously mentioned performance challenges in the industry.

The need for CPMM and CPMM frameworks within construction firms to provide a more comprehensive evaluation of their performance is more acute and pressing because of changes of the environmental factors of the highly competitive and turbulent construction business environment. A key environmental factor that triggers the need for PMM in construction is the complex managerial work within the construction organizations such as the implementation of various construction projects concurrently (Yu, Kim, Jung and Chin, 2007). Another significant environmental factor is the increasing complexity of construction projects (Lin and Shen, 2007). Some others factors include the development of both project management and technology in construction (Lin and Shen, 2007), and firms are operating within complex construction supply chains (Nudurupati, Arshad and Turner, 2007). Therefore, construction firms should place emphasis on designing and deploying appropriate CPMM frameworks as means of gathering and using relevant information on business activities for performance evaluation, performance improvements and benchmarking.

1.1.2 Saint Lucian construction industry and PMM

Saint Lucia is a small developing country in the Caribbean with a population of 0.18 million and economic growth of 3 percent in 2017 (International Monetary Fund, IMF, 2018). The construction industry in Saint Lucia plays an important role in its economic and social development. Moreover, it is among the three largest industries in Saint Lucia, representing 5.6 percent of Gross Domestic Product in 2017 (Government of Saint, GOSL, 2018). According to IMF (2018), GDP growth in the economy of Saint Lucia in 2017 has been driven by tourism and construction activities. Some of the key construction activities undertaken in the industry include planning and designing, infrastructural development such building of bridges, roads and dams, construction of new buildings including houses, repairs and maintenance and construction professional services.

Like in other countries, the Saint Lucian construction industry contains both public and private organizations that producing goods and services to meet the varied needs of clients. Government

of Saint (GOSL) is a major client as well as a regulator of the construction industry. In so doing, GOSL continues to invest and support the construction industry as mechanism to modernize and stimulate growth in the economy (IMF, 2018), impose regulations and develop appropriate infrastructure upon which the other sector depend (Sonson, 2017).

There is a growing interest in the area of PMM in construction in Saint Lucia, given the importance of the construction sector to the economy. The construction industry generates employment (Government of St. Lucia, GOSL, 2016), provides the infrastructure and buildings on which all other sectors of the economy depend, and acts as a stimulus to spur economic recovery and growth. However, the construction industry in Saint Lucia over the years has been characterised by high inefficiencies, low levels of productivity and high costs because of ineffective PMM. In recognition of these issues, the Government of Saint Lucia (GOSL) has established a National Competitiveness and Productivity Council (NCPC) in 2013 to promote productivity, competitiveness and improve overall performance at both the national and organization levels in the construction sector as well as other key sectors of the economy (NCPC, 2015). Furthermore, PMM in Saint Lucian construction industry has received some promotion as a consequent of government-commissioned audits (e.g. GOSL 2017). The 2017 Audit report emphasized that construction organizations should implement effective performance evaluation systems to monitoring performance standards and achieve stakeholder accountability in construction (GOSL, 2017). These initiatives have not been translated into improved performance in the industry. Accordingly, there is a strong need for Saint Lucian construction firms to find innovative management systems or frameworks such as CPMM framework to evaluate and improve their performance.

1.2. Problem and Justification/rationale for research

Business organizations need to adopt a CPMM framework comprising of both financial and non-financial performance measures across different perspectives to effectively measure and evaluate their performance in this dynamic business environment. Accordingly, the PM revolution has moved to the construction industry but at an incremental pace (Deng and Smyth, 2014) to support the business objectives in construction. In light of this, numerous studies on PMM in construction have been conducted in last two decades (Ali, Al-Sulaihi and Al-Gahtani, 2013; Jin, Deng and

Skitmore, 2013; Cheng, Wen and Jiang, 2014; Oyewobi et al., 2015). Most of the prior studies on PMM in construction have concentrated on measuring and evaluating project performance (Jin et al., 2013). In recent years, however, studies on PMM in construction at organizational level have increased in the literature (Yu et al., 2007; Jin et al., 2013). Whilst this is case, a few previous studies have attempted to develop conceptual frameworks for the performance evaluation of construction firms, and there have been few follow-up studies (Yu et al., 2007), and thereby leaving an empirical gap in the PMM literature.

Moreover, studies on PMM have attempted to distinguish between those carried out in developed and developing countries. This is because developed and developing countries are different in terms of the political, economic, social, cultural and technological contexts (Lizarralde, Tomiyoshi, Bourgault, Malo and Cardosi, 2013; Munir, Baird and Perera, 2013; Upadhaya, Munir and Blount, 2014) and construction (Lizarralde et al., 2013). Most of studies on PMM have been conducted empirically in developed countries such as UK and USA (Khan, Halabi and Sartorius, 2011; Upadhaya et al., 2014), while very limited studies have been undertaken in the context of developing countries (Ismail, 2007; Khan et al., 2011) such as Saint Lucia. This thereby creates an imbalance and leaves an empirical gap in the PMM literature.

In the context of Saint Lucia, construction firms has been measuring their performance. However, as far as the author is aware, use of contemporary performance measurement and management (CPMM) frameworks in the Saint Lucian construction industry has not been reported in the literature. The reasons for the limited or non-adoption of CPMM frameworks in the Saint Lucian construction industry are as follows. Generally, the market orientation of construction firms in Saint Lucia focused on national and to some extent regional markets. Therefore, these construction firms do not compete on the international markets, which may imply that they would not be encouraged to adopt innovative management systems such as CPMM frameworks. In addition, the major of construction firms in Saint Lucia are often classified as small to medium sized. Consequently, the SMEs construction firms in Saint Lucia generally would be reluctant to allot resources to or may consider themselves too small to apply innovative management systems and practices such as PMM frameworks.

Moreover, the limited or non-application of innovative management systems within Saint Lucian construction firms is also due to their slowness in adopting to change. Furthermore, there is evidence to suggest that Saint Lucian construction firms using traditional financial measures such as time and cost, profit, revenue to assess their business performance (Enterprise Surveys, 2013). This may implies that Saint Lucian construction firms would uphold to their traditional PM frameworks (although incremental adjustments to them) since they are slow to implement change. Furthermore, the construction industry lacks a well-defined performance measurement and management system because of the fragmented nature of the construction industry and lack of motivation to adopt one.

Over recent years, the Saint Lucian construction firm are facing many major challenges that it must respond to in the immediate future. The construction industry has been characterised by poor performance such as high inefficiencies, and low levels of productivity (National Competitiveness and Productivity Council, NCPC, 2015; GOSL, 2017). In this same vein, the construction client base has challenged this poor performance and compelled the industry to search for innovative managerial practices to improve construction performance and client satisfaction.

In Saint Lucia, the construction business environment has become increasingly competitive and dynamic because of the changing global financial climate, the changes in client requirements and changes the political arena (Sonson, 2017). In the same vein, the fragmented nature of the construction industry in Saint Lucia has given rise to the wide and varied client base/needs. Furthermore, construction clients in Saint Lucia are more knowledgeable, and are demanding better quality finished products and services and value for money (Sonson, 2017). In Saint Lucia, the credit conditions and financial regulatory compliance have continued to tighten, which may negatively affected the clients' demand for construction and the overall performance of the industry in the future.

Meanwhile, Saint Lucia is being highly exposure to climate change and natural disaster (IMF, 2018), which is major challenge for Saint Lucian construction industry in terms of building materials, structures and their values. However, climate change provides an opportunity for the Saint Lucian construction industry to work with other key industries in promote the using of

appropriate mitigation and adaptation measures (IMF, 2018). In order to meet this challenge, Saint Lucian construction industry would have to use better construction designs and techniques to improve building performance, construct more energy-efficient buildings, use more recycled materials, and develop and use appropriate performance measures and ultimately promote sustainable construction.

In summary, the above challenges of poor performance and the dynamic and competitive construction business environment can be viewed as drivers of change. These drivers of change are forcing the Saint Lucian construction industry to introduce organizational changes and adopt innovative management practices to improve its performance and client satisfaction. The effective implementation and use of a CPMM framework is increasingly recognized as an important management system to gain performance improvement in the construction industry.

Accordingly, this study is motivated to narrow the above gaps in the literature by investigating the PMM practices among construction firms in Saint Lucia to develop a CPMM conceptual framework to better measure and evaluate their performance. The proposed CPMM framework was developed to also embrace the interests and needs of construction firms' legitimate stakeholders such as shareholders (owners), customers, suppliers, employees, and the wider community, which are critical to their long-term survival, value creation and growth.

1.3. Research aim

The aim of this study is to develop a CPMM conceptual framework to better measure and evaluate the performance of construction firms in Saint Lucia.

1.4. Research questions

The research questions are the driving force for this study (Yin, 2018) and enables the study to achieve its aim. Accordingly, the following research questions have been articulated:

1. What is the current state of the research on performance measurement and management?
2. How to develop a PMM framework that can be used by Saint Lucian construction firms to measure and manage their performance?
3. Why Saint Lucian construction firms are using performance measures and information?

4. What are the main PMM frameworks being used by Saint Lucian construction firms to evaluate their performance?
5. What are the barriers the Saint Lucian construction firms facing in the implementation of a CPMM and what are the strategies that can be used to overcome these barriers?

1.5. Research objectives

In order to address the above stated research questions, the study attemps to achieve the following research objectives:

1. To identify the importance of performance measurement and management in general, in the construction industry, and in the Saint Lucian construction industry in particular;
2. To assess why and up to what extent construction firms in Saint Lucia measure and evaluate their performance;
3. To identify the extent to which performance measures of Saint Lucian construction firms are derived;
4. To identify the extent to which PMM frameworks are being used within Saint Lucian construction firms;
5. To identify and evaluate barriers to, and strategies for the implementation of CPMM framework within Saint Lucian construction firms;
6. To develop a CPMM framework that is able to better measure and evaluate the performance of construction firms in Saint Lucia;
7. To validate the developed CPMM framework in order to obtain confirmation of its applicability and useful to Saint Lucian construction firms.

1.6. The link between the research questions and research objectives

The research questions are concerned with the reason behind the study (Kumar, 2014). The research questions to be answered in this study seek to develop an understanding and insights on PMM from both theoretical and empirical perspectives. In this study, the research objectives act as guidelines for the various stages of the research methodological process and are closely related to the research questions. Table 1.5 shows the clear linkage or thread between the research questions and the stated research objectives. This would enhance the external validity of the study.

Furthermore, achieving the research objectives serves as evidence that the research questions have been fully addressed in the study.

Table 1.1 The link between research questions and research objectives

Research question (RQ)	Research objective (RO)
RQ1 – Identify patterns, theory, concepts of PMM in the literature and note gaps	RO1 – Establish the importance of PMM from the literature and note gaps.
RQ2 – Develop a PMM framework for use by Saint Lucian construction firms	RO2 – Identify the CSFs, performance measures and targets to be used within the PMM framework, which are being categorized into definable performance perspectives.
	RO3 – Identify sources used to develop performance measures.
	RO6 – Develop a PMM framework from the above objectives.
	RO7 – Validate the developed PMM framework.
RQ3 – Identify the use of performance measures.	RQ2 – Assess why firms use performance measures.
RQ4 – Identify the PMM frameworks used by firms.	RQ4 – identify and evaluateing the PMM frameworks used by firms.
RQ5 – Identifying the barriers and strategy for the implementation of a CPMM framework.	RQ1 – identify the barriers to and the strategied for the implementation of a CPMM framework.

1.7. Research methodological process

To fulfil the research overarching aim, objectives and questions, an appropriate research methodology was articulated. Kumar (2014) suggests that the path to seek for valid answers to the research questions and address the related research objectives would constitute research methodology. Thus, this study explores the research problems and questions through the adopted research methodological process.

This study was conducted in several stages in accordance with the research methodology. The various stages of the research methodology and therefore the research methodological path are depicted in Figure 1.1 below. It starts with the identification of the research topic, and ends with the conclusions of the research. This research methodological process demonstrates the link and synthesis between the concepts and theories from literature on PMM and the research evidence obtained, triangulated and validated to support and address the research problem and the related research questions and then draw informed conclusions about the objectives. Hence, the outcome

of the entire process contributes to the existing body of knowledge in PMM. The research methodological process adopted in this study is broken down into five stages as follows:

The first stage has been the identification and definition of the specific research area, which includes the selection of the research topic and the definition of the research problem on the topic (see 1.1 in the figure below). This was based on preliminary researching and reviewing the literature related to the topic and the researcher's insights, knowledge and experiences in the research area. The research aim and objectives, and the overarching research question and subsidiary research questions were also articulated based on the identified gaps on the literature.

The second stage of the research process was a critical review of the existing literature on the topic of PMM. The literature review concentrates on the definitions of PMM concepts, PMM frameworks and their elements, and lifecycle of a PMM framework. The literature review undertaken was used to support all the stages in the research process.

In the third stage of the research process, the research methodology was explained using the Saunders's Research Onion methodological model. Furthermore, an appropriate research methodology that allowed the research to collect and analyse relevant data and information in order to fulfil its aim and objectives, address the research questions and contribute to knowledge, was selected and justified.

The starting point of the research methodology was the research philosophy, which helped to identify and establish the other core aspects of the research including the research approach, strategy and methods. This research adopts a pragmatist philosophy, which focuses on answering the research question or addressing the research problem at hand. Moreover, pragmatism is underpinned by the belief that multiple research methods can be used in the research as a practical way of addressing the research problem. Under the adopted pragmatist philosophy, abductism was adopted as the research approach.

Mixed methods research, incorporating both quantitative and qualitative research, was employed as the methodological choice within the pragmatic philosophy or paradigm to deal with the

research at hand. More specifically, both quantitative and qualitative research strategies, methods and techniques were used in this research. Furthermore, survey (quantitative) and case study (qualitative) were employed as the research strategies. Moreover, the self-completion questionnaire (quantitative) was designed and used in the research as the research method for the survey, whereas semi-structured interviews (qualitative) were designed and adopted and relevant documents (qualitative) were collected, reviewed and analysed as research methods for the case study. The research population and the related samples were identified and selected.

Data collection and analysis stage is the fourth stage of the research process. As previously mentioned, both quantitative and qualitative data were gathered on the current status of PMM practices within the Saint Lucian construction industry, and then analysed to generate relevant findings. The quantitative data were gathered from the questionnaire survey, whilst the qualitative data were collected from the semi-structured interviews conducted and document review. The construction managers were selected as the study participants. Thematic analysis was used as the method of analysis of semi-structured interviews whilst descriptive and inferential statistics to some extent were used as the methods of analysis of the questionnaire survey. The quantitative data analysing process was supported by using by SPSS (version 23) and Microsoft Excel.

The Fifth stage of the study was the presentation and discussion of the analysis of research data and their associated results and findings. This stage showed what has been found from the of data analysis in keeping with the research aim, questions and objectives, captured the theories that emerged from the analysis and the discusses the findings in relation to the literature. The initial conceptual framework for PMM derived from the literature review was further developed and refined with the results and findings of the research. The refined conceptual framework was also empirically validated by data collected through structured and semi-structured interviews with experts in the Saint Lucian construction industry.

The conclusions is the final stage of the research process. It summarizes the key research findings in relation to each research objectives. Contribution to knowledge, the limitation of the research and suggestion for future research were also highlighted.

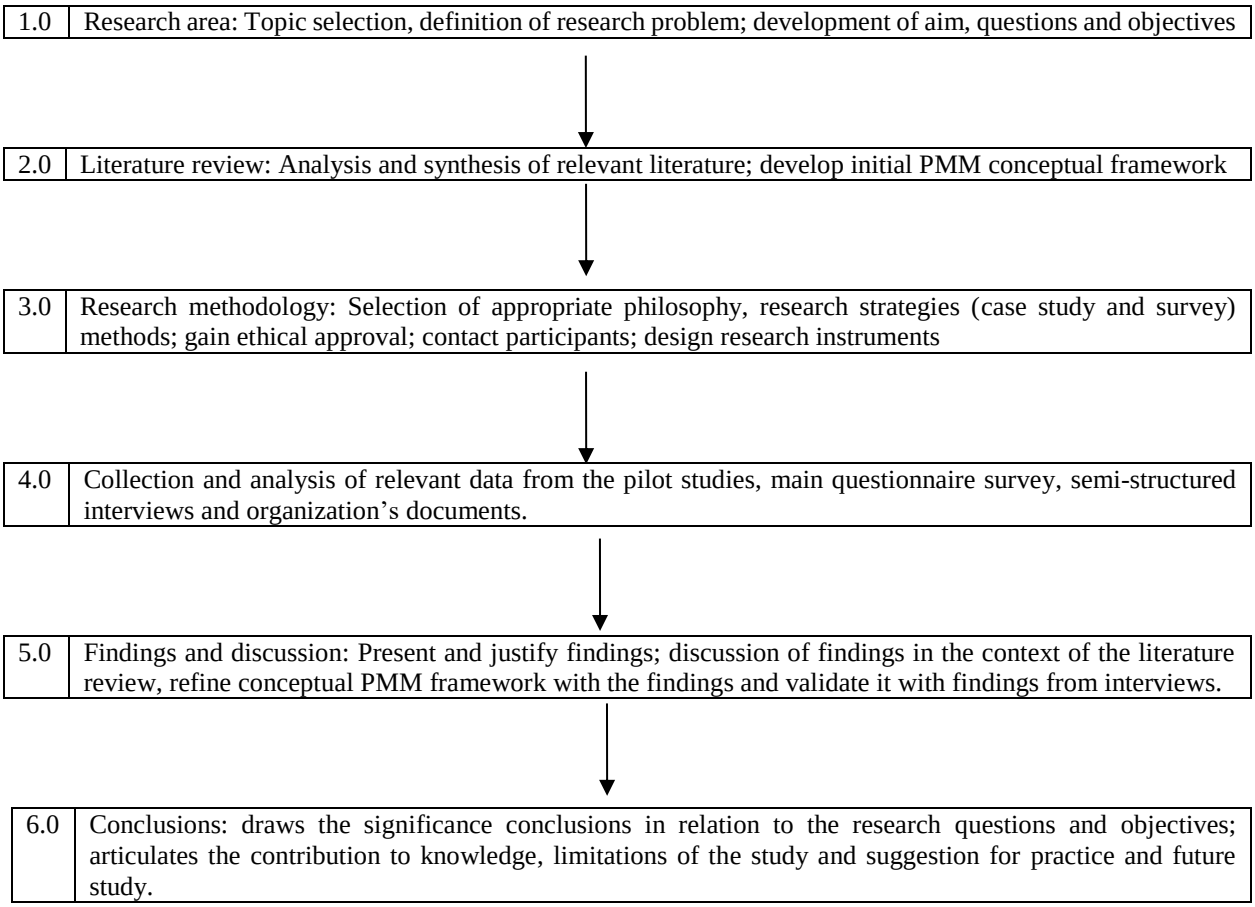


Figure 1.1 The adopted methodological path or process.

1.8. Scope of this research

The research scope refers to its focus and boundary, which is primarily formulated by the literature. The research problem, aim and objectives as well as resources and time constraints influence the research scope. Furthermore, the scope or boundary of this study includes among others the setting, concepts, and sampling (Miles, Huberman and Saldaña, 2014).

The aim of the study is to develop a CPMM framework that enables Saint Lucian construction firms to better measure, evaluate and manage their performance. Due to resources and time constraints, the scope of the study was limited to investigating the current PMM practices within

construction firms in Saint Lucia, which are private construction organizations. The participants of this research included only the managers from the Saint Lucian construction firms.

In relation to the setting, the study has been undertaken in Saint Lucia in Caribbean. The scope of research includes the review of extant literature on PMM in general and in particular in construction generate both the theoretical and conceptual frameworks for the study. The study paid due attention to the concepts and theories on organizational PMM, which also embeds project PMM. The study considers the main definitions of PMM concepts from literature review to understand the study area. It also highlights the core components of a PMM systems/framework. It further examines existing PMM systems and frameworks used to evaluate organizational performance as well as the lifecycle (design, implementation, use and review) of a PMM framework/system.

The boundaries for this sampling of study are based on the conceptual framework and research questions. The study develops an initial conceptual framework for PMM from the literature review, which articulates the core variables (including their interrelationship), for consideration in the study. The study focuses mainly on the key elements of PMM framework, the use of performance measures or PMM frameworks, and barriers to and strategies for PMM framework implementation. The scope does not include the review stage of the PMM framework lifecycle. Furthermore, the scope of the study was restricted to a survey and the two case studies to gather the research data. A questionnaire survey, semi-structured interviews and documentary analysis were deployed to gather the data for this study. The data and information were used to refine the PMM conceptual framework for construction firms in Saint Lucia. In addition, structured and semi-structured interviews were conducted to validate the resultant PMM conceptual framework. Finally, the validated CPMM framework is a major contribution of this study.

1.9. Chapter summary

This chapter has introduced the thesis. It includes the background, summary of the current state of PMM in general and in construction and context, followed by the definition of the research problem and the justification for the thesis. As well as outlining research aim, objectives and

questions, this chapter presents a summary of the research methodology adopted and the scope of the study. Finally, the structure of thesis is outlined in this chapter. The next chapter presents the literature review on PMM in general and in construction.

Chapter 2 Literature Review

2.1 Introduction

This Chapter provides a critical review of the extant literature on performance measurement and management and other related subject areas to the study. In particular, it discusses the concepts, principles and frameworks of performance measurement and management (PMM) in general, in business organizations and in context of construction. The chapter closes with a summary.

2.2 Definition of concepts

Brennan, (2003, cited in Franco-Santos et al., 2007) suggests that the definition of a concept is very important to identify the necessary and sufficient conditions for its existence. Moreover, definitions and terms are useful for any systematic pursuit of knowledge in an area of research (Oxford Dictionaries Online, 2012, cited in Choong, 2013b, p. 540). This study presents definitions from 2007 of important concepts and sub-concepts of performance measurement and management (PMM), including performance measurement, performance measure, performance measurement system, performance management, performance management system and performance measurement and management. The field of PMM is multidisciplinary and complex in nature, which gives rise to many different perspectives and definitions of its key concepts and sub-concepts in the literature. Therefore, the articulation of more than one definition of a concept or sub-concept should to provide more insight and understanding of it.

Yaghoobi and Haddadi (2016, p.960) define performance measurement (PM) as "a systematic process for obtaining valid information about the performance of an organization and the factors that affect performance". According to Grosswiele, Röglinger and Friedl (2013, p.1017), PM "aims to provide decision makers with information that enables them to take effective actions and to evaluate whether a company is progressing in line with its strategy". It can be seem that PM focuses on generating reliable information for management actions and satisfying stakeholders' expectations and needs. Further, Valmohammadi and Servati (2011, p.494) point out that PM is "the process of quantifying the efficiency and effectiveness of action". Drawing from the above definitions, performance measurement is a management philosophy that generates relevant

information on the activities of a business entity in order to accomplish its strategies, goals and objectives. Table 2.1 presents definitions of performance measurement.

Table 2.1 Definition of performance measurement

#	Author(s)	Definition
1	Moullin (2007)	PM provides the information needed to assess the extent to which an organization delivers value and achieves excellence (p. 182).
2	Radnor and Barnes (2007)	"PM is quantifying, either quantitatively or qualitatively, the input, output or level of activity of an event or process" (p. 393).
3	Tyagi, and Gupta (2008)	"Performance measurement is the process of developing indicators using metrics for driving progress toward business goals" (p. 8).
4	Elg and Kollberg (2009)	"PM is a process of collecting, computing and presenting quantified construct for the managerial purposes of following up, monitoring and improving organizational performance" (p. 410).
5	Ali and Rahmat (2010)	PM is "the process of evaluating performance relative to a defined goal".
6	Serrat (2010)	"Performance measurement is the process of gauging achievements against stated goals" (p.1).
7	Valmohammadi and Servati (2011)	PM is "the process of quantifying the efficiency and effectiveness of action" (p.494).
8	Pedersen and Sudzina (2012)	"PM is about selecting and using indicators of organizational performance to assess how well an organization is doing in order to identify room for improvement" (p.5).
9	Grosswiele et al. (2013)	PM "aims to provide decision makers with information that enables them to take effective actions and to evaluate whether company is progressing in line with its strategy" (p.1017).
10	Yaghoobi and Haddadi (2016, p.960)	PM is "a systematic process for obtaining valid information about the performance of an organization and the factors that affect performance".
11	Smith and Bititci (2017)	PM is defined as the processes of developing measures, target setting, collecting, analysing and reporting performance information, and interpreting and assessing performance differentials (p.1210).

As Parmenter (2007, p.14) indicates, "Performance measure refers to an indicator used by management to measure, report, and improve performance". This definition captures some of their key definable roles. Performance measures allow organizations to capture, analyse and manage their performance against defined objectives and targets (de Leeuwa, and van den Berg, 2011). A performance measure or indicator is one that is "capable of generating a quantified value to indicate the level of performance taking into account single or multiple aspects" (Parida and Kumar, 2006, cited in Myeda, Kamaruzzaman and Pitt, 2011). In this study, a performance measure can be used to measure the contribution of resources and activities of an organization.

It is important to place performance measures within a robust measurement framework or system so an organization can effectively measure and monitor its performance. According to Ahmad and

Zabri (2016, p.477), “Performance measurement (PM) system is a group of techniques developed by an organization to evaluate the performance of business activities”. Munir and Baird (2016, p.109) suggest a PM system is “mainly designed to provide useful information to support strategic decision-making, planning and the control of activities in order to accomplish organizational goals”. A PM system can also be described as a set of performance measures that are jointly considered when making sense of the performance of an organization (Carlsson-Wall, Kraus, and Messner, 2016, p.49). Micheli and Mura (2017) suggest that PM system is a measurement system that comprises financial and non-financial indicators, which are related to different aspects of an organization’s operations, and have a relationship between strategy and organization’s performance (p.423). Drawing from the above definitions, a PM system incorporates a set of performance measures or techniques that provide relevant information to support management processes and actions such as planning, management, control and decision-making.

It has been suggested that measurement of performance is important but not sufficient and consequently there has been the shift in emphasis towards performance management, which is supported by performance measurement. In an organizational context, performance management is a “continuous process of identifying, measuring, and developing the performance of individuals and teams and aligning performance with the strategic goals of the organization” (Aguinis, 2013, p.2). Moreover, Aguinis (2013) notes that performance management focuses on ensuring the behaviors of people are consistent with the achievement of organizational goals. Similarly but from a broader perspective, Armstrong (2017, p.7) defines performance management as “the continuous process of improving performance by setting individual and team goals which are aligned to the strategic goals of the organization, planning performance to achieve the goals, reviewing and assessing progress, and develop the knowledge, skills and abilities of people”. Bititci, Cocca and Ates (2016, p.1572) define Performance management as “the iterative closed-loop process in which performance measures are used to manage and improve organizational performance through continuous adaptation to the changing operating environment”.

These above definitions show that performance management generally emphasis goal-orientation and performance improvement. Furthermore, these definitions illustrate that performance management places emphasis on developing, empowering and motivating employees to do their

best to achieve goal congruence. Drawing from these definitions, performance management is the process in which performance measures are used to manage and improve performance of an organization and its members in order to achieve individual and organizational goals. In summary, performance management involves managing, resourcing and improving performance of an organization. Table 2.2 presents definitions of performance management.

Table 2.2 Definition of performance management

#	Author(s)	Definition
1	Radnor and Barnes (2007)	Performance management is the action, based on performance measurement, which results in improvements in behaviour, motivation, processes, and promotes innovation (p.393).
2	Moynihan (2008)	Performance management is defined as "a system that generates performance information through strategic planning and performance measurement routines and that connects this information to decision venues, where, ideally, the information influences a range of possible decisions" (p.5).
3	Smither and London, (2009)	Performance management refers to an ongoing process that includes setting (and aligning) goals, coaching and developing employees, providing informal feedback, formally evaluating performance, and linking performance to recognition and rewards (p. XV).
4	Brudan (2010)	"Performance management deals with taking action based on the results of the evaluation and ensuring the target results are achieved" (p.11).
5	Biron, Farndale and Paauwe (2011)	Performance management embraces "all those aspects of human resource management that are designed to improve the efficiency and effectiveness of both the individual and the organization" (p.1306).
6	Atkinson (2012)	Performance management is concerned with using performance measurement information to focus on what is important, manage the organization more effectively and efficiently and promote continuous improvement and learning (p.48).
7	Aguinis (2013)	Performance management is a "continuous process of identifying, measuring, and developing the performance of individuals and teams and aligning performance with the strategic goals of the organization" (p.2).
8	Bititci (2015)	Performance management is defined as the cultural and behavioural routines that define how an organization uses the performance measurement system to manage its performance (p.29).
9	Bititci, Cocca and Ates (2016)	Performance management is "the iterative closed-loop process in which performance measures are used to manage and improve organizational performance through continuous adaptation to the changing operating environment" (p.1572).
10	Armstrong (2017)	Performance management as "the continuous process of improving performance by setting individual and team goals which are aligned to the strategic goals of the organization, planning performance to achieve the goals, reviewing and assessing progress, and develop the knowledge, skills and abilities of people" (p.7).
11	Akhtar and Sushil (2018)	Performance management describes the processes, methodologies, metrics and systems needed to measure and manage performance of the organization (p.923).

Business organizations can make use of a performance management system to manage and improve their performance. Some authors (Melnyk et al., 2014; Micheli and Mari, 2014; Smith

and Bititci, 2017) posit that a performance management system is one that make use of the outcome of performance measures to manage and improve organizational performance. Performance management system is a system that facilitates the implementation of organizational strategy by communicating to employees about the priorities of the organization, assigning responsibility and accountability for behaviour and outcomes and guiding to enhance performance (Biron et al., 2011; Jha and Jha, 2018, p.81). According to Elzinga, Albronda and Kluijtmans (2009, p.509), performance management system consists of a balanced set of factors that are critical for the success of an organization, and a limited number of performance measures use to track and manage organizational performance. As the above definitions suggest, a performance management helps a business organization to manage its strategy and improve its performance.

Brudan (2010) suggests that organizational performance is associated with two interrelated and distinctive processes, namely performance management and performance measurement. A number of authors (e.g. Brudan, 2010; Hall, 2018) argue that these two distinctive processes are inseparable and one creates the context for the other. This study suggests that it would be misleading to denote or delineate the field as performance measurement or performance management. In line with this, the focus on organizational performance in recent years has shifted from performance measurement or performance management to performance measurement and management (PMM), which is the focus of this study.

PMM is the process in which an organization defines its mission, strategy and objectives, making them measurable through critical success factors (CSFs) and performance measures in order to be able to take corrective actions to keep it on track (de Waal, 2007; cited in de Waal and Kourtit , 2013). PMM encompasses two types of organizational control, namely, technical/structural control and social (cultural and behavioural) control (Bititci, 2015). The technical control of performance measurement is mainly concerned with what to measure and establishing managerial processes such as setting direction and measures (Bititci et al., 2012; Melnyk, Biticci, Platts, Tobia, and Andersen, 2014; Bititci et al, 2015, p.3064). On the other hand, the social control of performance management focuses on how these structures, example measures are being used to manage the organizational performance as well as managerial routines such communications and establishing organizational culture (Bititci et al, 2015, p.3064). To achieve sustainable performance,

organizations should strike a balance between these two organizational controls appropriate to their context (Bititci, 2015).

Meanwhile, Hull (2018) describes a PMM system as a system that adopts broad set of specific measures to measure and manage business performance. A PMM system "operationalizes firm strategy with a set of performance measures" (Choi, Hecht and Tayler, 2013, p. 105). In a similar vein, Hourneaux Jr, Carneiro-da-Cunha and Corrêa, 2017, p.150), define PMM system as "a system of management indicators that covers all relevant perspectives of the organization and monitors and drives the organizational strategy to the operational level, to communicate that strategy to the entire organization and to its stakeholders". Furthermore, some authors (Melnyk et al., 2014; Micheli and Mari, 2014; Smith and Bititci, 2017) posit that a PMM system is the integration of a performance measurement system and a performance management system. Based on the above discussion, PMM system can be defined as a system comprises a set of performance measures to measure and manage the strategy, performance, and behaviour of an organization.

2.3 Developments and trends in PMM

It is noticeable that PMM has received growing attention and importance in the last two decades (Mathur, Dangayach, Mittal and Sharma, 2011; Tung, Baird and Schoch, 2011; Taticchi, Balachandran and Tonelli, 2012). The fundamental importance of PMM emanated from the premise that it enables organizations to meet their desired objectives and goals (Zigan and Zeglat, 2010; Baird, 2017), and to respond to the changes in the internal and external business environments and strategies (Bititci et al., 2012). The evolution in the environment and the dissatisfaction with traditional PM systems have led to a PM revolution, which started from the mid-1980s (Neely, 1999; Nudurupati and Bititci, 2005; Hinton and Barnes, 2009). Since then, the PM revolution has led to developments in PMM and many changes in organizational practices.

Firstly, there was a shift in organizational practice from traditional PM systems/frameworks relying solely on financial measures to contemporary performance measurement and management (CPMM) systems/frameworks using both financial and non-financial measures to assessing business performance (Franco-Santos et al., 2012; Behery et al., 2014). This implies a move from

the unidimensional (essentially financial) nature to the multidimensional nature of PMM systems and frameworks. Furthermore, the adoption of multidimensional PMM implies that business organizations have been moving beyond the practice of measurement and control of performance towards the practice of measurement and management of performance. Moreover, business organizations over the years have been using two main types of PMM system: traditional PM system and CPMM system (Burgess, Ong and Shaw, 2007; Srivastava and Sushil, 2013).

Secondly, a shifted in orientation from operations to strategy (Srimai et al., 2011). More specifically, there is an ongoing movement from traditional PM systems/frameworks with no or little alignment with organizational strategies and measuring efficiency to CPMM systems/frameworks with strong alignment with organizational strategies, and support continuous improvement and learning (Burgess et al., 2007; Sainaghi et al., 2017).

Thirdly, organizational practice has also shifted from satisfying the interests of shareholders and creating shareholder values to satisfying the interests of multiple stakeholders such as customers, employers, suppliers and creating stakeholder values (Srimai et al., 2011; Upadhaya et al., 2014). Furthermore, appropriate stakeholders and senior managers of a business organization should engage in the selection and development of a CPMM system in order to ensure that organizational objectives are met (Gunasekaran et al., 2015).

These aforementioned changes after the mid-1980s have led to the development of numerous CPMM systems/frameworks that have been used to measure and manage organizational performance (Baird, 2017; Micheli and Mura, 2017). The Balanced Scorecard (BSC) and Performance Prism are examples of the developed CPMM systems/frameworks (Baird, 2017; Micheli and Mura, 2017).

Recent development in PMM has signalled the need to reposition risk management from an operational and technical role to a more strategic and corporate role in PMM in line with the emergence of enterprise risk management (Andersen, 2008; Arena and Arnaboldi, 2014) and black swan events (Taleb, 2009). This paradigm shift has led to a considerable increase in the awareness and importance of risk management within business organizations (Arena and Arnaboldi, 2014).

Andersen (2008) found that firms that demonstrate effective total (enterprise) risk management will achieve higher corporate performance. Accordingly, business organizations should place emphasis on incorporating risk measures or perspective within their PMM systems/frameworks.

In addition, emerging trends in PMM have been towards sustainability, inter-organizational collaborationincluding supply chains and collaborative organizations (Bititci et al., 2012). Furthermore, these recent trends and developments in PMM are have implications for the construction industry. They are explained in the following sections.

Emerging development in PMM have also emphasized the need for the inclusion of sustainability perspective and/or measures in a PMM framework (Davila, 2012, Pedersen and Sudzina, 2012; Zhou, Keivani and Kurul, 2013; Shokravi and Kurnia, 2014), or for a sustainability PMM framework (Gadenne, Mia, Sands, Winata and Hooi, 2012; Zhou et al., 2013; Kang, Chiang, Huangthanapan and Downing, 2015; Cavicchi and Vagnoni, 2018). Taticchi et al. (2015) suggest that many business organizations have implemented sustainability measures for three reasons, namely (1) transparency and communication to stakeholders, (2) improvement of operations and (3) strategy alignment (p.6476). Bititci et al. (2012) argue that the emergence of sustainability in PMM should provide business organizations with an opportunity for improving performance and gaining competitive advantage. This implies that business organizations need to adopt the stakeholder approach to their corporate sustainability and performance. In their study in the UK, for example, Zhou et al. (2013, p. 246) found that "care of end-users, whole-life costing, health and safety, capital cost, energy consumption during operation and low maintenance cost" are core sustainability measures appropriate to construction. Similarly, there is increasing emphasis on incorporating social responsibility measures or perspectives within PMM systems (Kansal and Singh, 2012; Kang et al. 2015). The study of Kansal and Singh (2012) found that performance measures for community development and human resources are more widely used among the Indian corporate organizations.

Usually, PMM has been applied within the boundaries of a single organization, which can span different processes and functions, involve different organizational units and projects, and use different types of measures to assess its performance (Maestrini, Luzzini, Caniato, Maccarrone

and Ronchi, 2018). In this context, business organizations are using intra-organizational PMM systems/frameworks. However, there is a recent move towards extending PMM to inter-organizations and collaborations and business networks (inter-organizzational as well trans-organizational groups) and thereby developing suitable measures across these different organization types (Bititci et al., 2012; Ferreira et al., 2012; Altin, Koseoglu, Yu and Riasi, 2018; Maestrini et al., 2018). In the same vein, there has been a move towards the development of PMM systems/frameworks for the supply chain, known as supply chain PMM systems/frameworks (Bhagwat and Sharma, 2007; Forslund, 2012; Piotrowicz and Cuthbertson, 2015; Gawankar, Kamble, and Raut, 2016; Maestrini, Luzzini, Caniato, Maccarrone and Ronchi, 2018). This implies that business organizations would shift their attention from intra-organizational PMM systems to inter-organizational PMM systems/frameworks (i.e. those that focus on evaluating the performance of multiple organizations) (Maestrini et al., 2018). Altin et al. (2018) argue that there is a need to focus on measuring and managing the contribution and performance of members of an inter-organizational group and a collaboration and business network. Shadid (2018) also points out that business networks could help construction organizations to survive in turbulence conditions.

It can be argued that a well-designed PMM system/framework across different business organizations would improve their performance and effectiveness. However, the application of a PMM system/framework within inter-organizations including supply chains, and collaborative organizations and business networks is challenging because of the need for great coordination and integration of different functions, processes and infrastructures across different organizations, information sharing between organizations, external organizational perspectives (external connection) and relationship management (Liang, 2015; Maestrini et al., 2018). Furthermore, it is expected that the PMM systems/frameworks across inter-organizations and business networks is applicable in the construction industry, however they pose a significant challenge in the construction industry because of its very fragmented and adversarial practices.

It is imperative that business organizations align the sustainability (i.e. economic, environmental and social) measures (Taticchi et al. 2015; Nudurupati, Tebboune and Hardman, 2016), social responsibility measures and collaboration and network measures to their strategy. Moreover, the emergence of sustainability, collaboration and networking, and corporate social responsibility

agenda has increased the need for broader and democratic participation of relevant stakeholders in the PMM process.

2.4 PMM systems/frameworks

PMM frameworks adopted by business organizations can comprise of only financial performance measures or non-financial performance measures or both. As previously mentioned, the literature identifies two types of PMM systems or frameworks, namely traditional PMM systems/frameworks and contemporary PMM systems/frameworks (Burgess et al., 2007; Srivastava and Sushil, 2013; Behery et al., 2014; Yaghoobi and Haddadi, 2016). They are discussed in the following sections.

2.4.1 Traditional PMM systems/frameworks

Prior to the mid-1980s, the business organizations used PM systems/frameworks such as management accounting systems that were based solely on financial performance measures. Examples of performance measures of traditional PM systems/frameworks include profit, cash flow and return on investment (Yaghoobi and Haddadi (2016). The traditional financial based PM systems/frameworks played an important role in controlling and monitoring the business activities and performance of business organizations (Niven, 2006, 2008; Yaghoobi and Haddadi, 2016). Accordingly, organizational control efforts were concentrated on budgetary control, cost reduction and feedback control. Moreover, traditional financial based PM systems/frameworks assist business organizations in the comparison of their actual and desired performance (Abdallah and Alnamri, 2015) and in satisfying their legislative and regulatory requirements (Jusoh, Ibrahim and Zainuddin, 2008). Another vital role of traditional financial based PMM frameworks is that they help business organizations to demonstrate the extent of their financial accountability (Noordin, Haron and Kassim, 2017).

However, traditional PMM frameworks have been heavily criticised by both academics and practitioners due to their shortcomings. The critics argue that traditional financial-based PMM frameworks are not consistent with today's ever-changing business environment, lack predictive power (Niven, 2006, 2008; Choong, 2013a), are focused on past performance, are internally

focused (Silvi et al. 2015; Mishra, Gunasekaran, Papadopoulos and Dubey, 2018) and describe consequences or results of past actions rather than the causes (Tung et al., 2011). They ignore the other important aspects of a business organization's performance such as product quality and customer satisfaction, which were critical to compete successfully in the competitive business environment (Drury, 2015). Consequently, many new or CPMM frameworks or systems such as the BSC have been developed in order to overcome the perceived limitations of traditional financial-based PMM frameworks (Jusoh et al., 2008; Munir and Baird, 2016). In addition to the financial performance measures, the CPMM frameworks include non-financial performance measures as well as additional relevant perspectives or dimensions (Srimai, et al., 2011).

2.4.2 CPMM systems and frameworks

From the mid-1980s, researchers and practitioners have proposed many CPMM systems and frameworks to address the inadequacies of the traditional PM frameworks due to the dynamic business environment (Biazzo and Garengo, 2012). Some authors have attempted to distinguish between CPMM systems and CPMM frameworks, while others use them interchangeably. CPMM systems and frameworks have many different characteristics and different levels of sophistication.

It has been generally recognized that a CPMM system a one that comprise performance measures, the articulation of the relationship among the measures, and the supporting infrastructure to collect, process and analyze data and use information on the measures (Franco-Santos et al., 2007). The supporting infrastructure may include ICT infrastructure and human resource infrastructure necessary to implement and use the PMM system effectively. In addition to the performance measures, a CPMM system should comprise people, procedures, data, software, and hardware (Wettstein and Kueng 2002). According to Chenhall, Hall and Smith (2014, p.3), a PMM system usually comprises spreadsheets, performance measures/indicators and performance reports. Some other suggest that CPMM frameworks should include performance measures, targets, incentives and other management control, and deliver their intended consequences from their effective use (Franco-Santos et al., 2012; Melnyk et al., 2014; Bititici, 2015; Smith and Bititci, 2017). However, Franco-Santos et al. (2012) suggest that business organization should pay particular attention to the unintended consequences of PMM frameworks as they can negative impact on them.

Most CPMM systems (and frameworks) entail both financial and non-financial performance measures (Baird, 2017; Maestrini, Luzzini, Maccarrone and Caniato, 2017; Mishra et al, 2018). The literature asserts that CPMM systems (and frameworks) should comprise both financial and non-financial performance measures that are linked to the organizational strategy (Franco-Santos et al., 2012; Baird, 2017), and to the organization's critical success factors (CSFs) or value drivers (Baird, 2017). The performance measures of the CPMM system should embrace both tangible and intangible aspects of the business organizations (Mishra et al., 2018). Many authors posit that the performance measures of the CPMM systems (and frameworks) should cover different perspectives of an organization (Bisbe and Malagueno, 2012; Saunila, 2016).

In addition to performance measures, a CPMM systems (and frameworks) should include the following common characteristics: integration of long-term and short-term horizons, combination of external and internal orientation of the measures, inclusion of both forward-looking and backward looking perspectives, and identification of causal relationships between the different measures and perspectives (Silvi et al., 2015). Furthermore, CPMM systems/frameworks should support linkages between rewards and organizational performance or outcomes such as customer satisfaction and employee satisfaction (Siti-Nabiha, Thum and Sardana, 2012). Yuliansyah et al. (2017) suggest that a CPMM system/framework should be linked to strategic and operational activities of an organization as well as to the behavioural aspects of employees.

Importantly, CPMM systems should comprise a supporting infrastructure, which can vary from being a simple method of data collection and analysis (using, for example, Microsoft Excel) to a sophisticated information system such as enterprise resource planning (Franco-Santos et al., 2012). More specifically, a CPMM system should have an ICT/IT infrastructure such as Management information system (MIS) for gathering, analysing and storing the data for PMM (Nudurupati, Bititci, Kumar and Chan, 2011; Marx, Wortmann and Mayer, 2012; Pellinen, Teittinen and Järvenpää, 2016). An IT enabled PMM framework would facilitate linkage with other management systems.

Once an organization has established the appropriate performance measures and MIS, the next PMM system lifecycle stage is for it to implement the performance measures (Nudurupati et al., 2011). The implementation of performance measures involve capturing, collecting processing and analysing performance data, and reporting and distributing the resulting performance information (Bourne et al., 2000; Nudurupati et al., 2011). The resultant performance information should be communicated to managers at all levels in the form of performance reports to enable them to make timely and effective decisions (Nudurupati et al., 2011). Furthermore, the performance reports should consist of information on both financial and non-financial aspects of a business organization. Some studies (Goh, Elliott and Richards, 2015; Smith and Bititci, 2017) emphasize the importance of producing quality performance reports. IT/ICT enables CPMM frameworks to produce quality performance reports as well as enables appropriate stakeholders to gain access to the reports (Forslund, 2012). Some previous studies (e.g. Kroll, 2015) have suggested that the production and use of quality performance reports can enhance the accountability of business organizations. Furthermore, it is important to review performance reports periodically to ensure that the CPMM framework is producing the relevant information for action and decision-making. It is imperative to note that the success of a CPMM system depends on how people use the performance information generated by it (Nudurupati et al., 2011).

The business organizations need to allocate appropriate human resource infrastructure to effectively management their CPMM system at every lifecycle stage.

On the other hand, Folan and Browne (2005) suggest that a CPMM framework involves the active deployment of a particular set of measures (both financial and non-financial) of performance that has to be monitored and evaluated; and specifies a multitude of key performance dimensions that reflect the key business areas of an entity and the relationship among them. In summary, a CPMM framework usually comprise a set of performance measures, performance dimensions (perspectives) and articulate the relationship between them.

Folan and Browne (2005) differentiate between two types of CPMM framework: a structural framework and a procedural framework. Structural framework specifies the typology for PMM (e.g. balanced scorecard and performance prism), and is concerned mainly with management and

selection elements (e.g. performance measures) of the PMM process (Folan and Browne, 2005). According to Folan and Browne (2005), the procedural framework is the step-by-step or systematic process for developing performance measures from strategy. The procedural CPMM framework provides information and insights on how to develop, implement, use and review the PMM framework or system (Gutierrez et al., 2015, p.1). Folan and Browne (2005) further point out that most CPMM frameworks identify in the literature are structural framework rather than the procedural framework. Folan and Browne (2005) claim that a successful CPMM system should contain both structural and procedural frameworks as well as a number of other performance management tools, such as a list of measures. In this study, CPMM system and CPMM framework are used interchangeably.

2.5 Salient features CPMM systems/frameworks

2.5.1 Performance perspectives

As previously mentioned, the performance measures of the CPMM systems/frameworks should cover different perspectives of a business organization's performance (Bisbe and Malagueno, 2012; Munir and Baird, 2016; Saunila, 2016). These performance perspectives should be related to relevant aspects of a business organization (Micheli and Mura, 2017) and integrate the interests of its key stakeholders (Pesic and Dahlgaard, 2013; Ha et al., 2017). CPMM systems include both financial and non-financial perspectives of organizational performance (Sigalas, 2015; Gawankar, Kamble, and Raut, 2016) as well as internal and external perspectives (Gawankar et al., 2016). The CPMM systems/frameworks should balance organizational strategic, tactical and operational perspectives (Parida, Kumar, Galar and Stenström, 2015). Commonly cited examples of performance perspectives of a CPMM system/framework include financial, customer, internal business processes, learning and growth (Behery et al., 2014; Yaghoobi and Haddadi, 2016; Sofiyabadi, Kolahi and Valmohammadi, 2016; Baird, 2017), and productivity (Ben Hadj Salem-Mhamdia, 2013). Other examples of performance perspectives include innovation (Saunila and Ukko, 2012), sustainability (Tung et al., 2011), environmental performance (Björklund and Forslund, 2013), and Environment/community perspective (Parmenter, 2015) and creativity (Ben Hadj Salem-Mhamdia, 2013).

2.5.2 Critical success factors (CSFs)

The CPMM system/framework of a business organization should include critical success factors (CSFs) for each of its performance perspectives. This is because CSFs are the particular areas of significant importance to a business organization and its industry at a particular point in time (Yong and Mustaffa, 2012, p.545). Moreover, CSFs are crucial for the achievement of an organization's mission and strategic goals and objectives (Toor and Ogunlana, 2010; Parmenter, 2015; Tsironis, Gotzamani and Mastos, 2017). In the same vein, CSFs should be embedded in the strategy of an organization (Watts and McNair-Connolly, 2012). Accordingly, business organizations should focus their limited resources on their CSFs in order to achieve success (Yong and Mustaffa, 2013). CSFs tend to be organization-specific and/or industry-specific, and can change over time (Yong and Mustaffa, 2012).

The literature identifies numerous organizational CSFs. Profitability, growth, stability (Yu et al., 2007), client/customer satisfaction (Ofori-Kuragu, Baiden and Badu, 2016) and quality of service/product (Tsironis et al., 2017) are some commonly cited examples of an organization's CSFs that can be incorporated in CPMM systems/frameworks for performance evaluation. Quality assurance, leadership, resource management, and processes management are some other important CSFs identify in the study Talib, Ali, and Idris (2014).

2.5.3 Performance measures

2.5.3.1 Performance measure types

In the literature, performance measures are classified into various groups such as objective and subjective measures, quantitative and qualitative measures, lagging and leading measures, and financial and non-financial measures. Nudurupati et al. (2007) suggest that the objective measures make use of mathematical formulae to calculate the respective values, while the subjective measures make use of opinions and personal judgment of managers and other stakeholders. ACCA (2015) posits that quantitative measures are those that can be expressed in numerical terms, while qualitative measures are those that cannot be expressed in numerical terms, which can be supported by numerical data. Drury (2015) suggest that lag or (outcome) measures are essentially financial measures that capture the results or outcomes of the past actions, whereas lead (process) measures are essentially non-financial measures that are drivers of future financial performance. Meanwhile,

Teeratansirikool, Siengthai, Badir and Charoenngam (2013, p.174) define financial performance measures as measures that provide performance information in monetary terms and reflecting financial values. On the other hand, non-financial performance measures are described, "as measures that provide performance information in non-monetary terms" (Verbeeten and Boons, 2009, p.116).

This study adopts the classification of performance measures into financial and non-financial. Financial performance measures generate information that relates to the financial results of the business activities of an organization that were performed in the past (Upadhaya et al., 2014; Saunila, 2016), which are important to create value for shareholders. Some authors (Jusoh et al., 2008; Hegazy and Tawfik, 2015) suggest that financial performance measures show the extent to which an organization's strategy implementation and execution can effectively contributes to its bottom line improvement. The role of financial performance measures is explained in section 2.4.1.

Kulatunga, Amaratunga and Haigh (2011) suggest that non-financial performance measures are essentially leading indicators that could assist business organizations to take corrective actions before their overall performance is affected. This implies that non-financial performance measures could service as a feedforward control mechanism. They are also capable of predicting future performance as well as driving the performance of business organizations (Dossi and Patelli, 2010). Some authors (Ittner and Larcker (1998, p. 217) identify three main reasons for introducing non-financial performance measures in business organizations. They include (1) perceived limitations in the use of traditional financial measures, (2) increased competitive pressure, and (3) implementation of other modern organizational management systems and practices such as Total Quality Management (TQM). Examples of non-financial measures include customer satisfaction rating, employee motivation level, quality, productivity level, and market share (Upadhaya et al., 2014).

Business organizations deploy non-financial performance measures to capture and evaluate the other strategic aspects of their performance such as those relating to strategy management, product development and competitiveness (Larimo, Nguyen and Ali, 2016). Northcott and Smith (2011) emphasize that non-financial performance measures reflect the strategic importance and needs of

other key organizational stakeholders, such as suppliers, employees and customers. Previous research found that the inclusion of non-financial measures in CPMM systems contribute to the strategic alignment of organizations through continuous learning and dialogue within them (Dossi and Patelli, 2010) and to improving productivity and efficiency of employees (Abdallah and Alnamri, 2015). Upadhaya et al. (2014) concluded that non-financial measures are closely related with organizational effectiveness.

Notwithstanding the importance of non-financial performance measures, they do have some limitation. For example, they can increase the complexity of the PMM system, leading to goal incongruence (Verbeeten and Boons, 2009).

Baird (2017) suggests that contemporary (financial and nonfinancial) performance measures can be utilized to achieve the strategic objectives of an organization. The contemporary performance measures of CPMM system can be used to measure and evaluate the organizational performance (Franco-Santos et al., 2012; Silvi et al., 2015; Abdallah and Alnamri, 2015) as well as to capture a holistic view of organizational performance (Gutierrez, Scavarda, Fiorencio and Martins, 2015). Parmenter (2015) suggest that both financial and non-financial performance measures should assist the managers and employees to focus on the CSFs a business organization. Ferreira and Otley (2009, p.271) suggest that key performance measures are "used at different levels in organizations to evaluate success in achieving their objectives, CSFs, strategies and plans, and thus satisfying the expectations of different stakeholders".

Generally, using a broad set of both financial and non-financial measures to meet organizational objectives is called performance measurement diversity and has some potential benefits for business organizations. It has been argued that using more non-financial performance measures in a PMM framework is expected to increase PM diversity. Previous studies found that firms with greater diversity of performance measures in their PMM frameworks are more effective at directing effort and attention toward the achievement of their strategic priorities and objectives (Dekker, Groot and Schoute, 2013; Bedford, Bisbe and Sweeney, 2018), and hence are achieving better organizational performance (e.g. Tung et al., 2011). Moreover, Hartmann and Slapnicar (2012, p.28) claim that higher "Diversity of performance measures leads to significantly higher

fairness perceptions by managers in higher task uncertainty situations". Along the same line, Cheng and Humphreys (2016) found that organizations make greater use of performance measurement diversity to evaluate performance when they are facing higher strategic uncertainty. Furthermore, diversity of measures in CPMM frameworks would provide a more balanced view of organizational performance by capturing both leading performance measures (e.g. customer satisfaction, employee training, etc.) and lagging performance measures (e.g. profit, sales, etc.) (Tung et al., 2011). Baird (2017) argues that increase the diversity of measures will provide organization's stakeholders with more information on organizational performance and managerial actions as well as ultimately enhance its CPMM system effectiveness.

However, PM diversity of CPMM systems and frameworks has some potential limitations. It can give rise to cognitive limitations of managers and other users to process multiple performance measures and use the PMM system (Lipe and Salterio, 2002; Cheng, Luckett and Mahama, 2007; Rasit and Ismail, 2012). In the same vein, Rasit and Ismail (2012) argue that the cognitive limitations of managers may prevent business organizations to benefit fully from using the PMM system, and may lead to a wide variation in the use of the PMM system. Mutual consistency among multiple performance dimensions or perspectives may be problematic when multiple measures are disaggregated within them (Lillis, 2002, p.510). Moreover, there can be difficulty in attaching different weights of importance to the different performance measures (Moers, 2005). Some authors (e.g. Cheng et al., 2007; Rasit and Ismail, 2012) argue that use of multiple performance measures may have negative behavioural consequences of PMM system because of the cognitive limitations of managers to cope with incompatible demands from the inclusion of multiple goals of organizational stakeholders and hence goal conflict.

2.5.3.2 Development of Performance measures

The focus of a business organization should be on developing and selecting performance measures for its relevant perspectives for inclusion in its PMM framework. According to Niven (2014), business organizations should ensure that every key component of their PMM framework (such as perspectives, performance measures and CSFs) is derived from their strategy. Similarly, Kaplan (2012) strongly advocates that performance measures should be derived from an organization's strategy. Many other authors (e.g. Groen, van de Belt, and Wilderom, 2012; Najmi and Makui,

2012; Dekker et al., 2013; Jääskeläinen and Roitto, 2016; Alach, 2017; Baird, 2017; Yuliansyah et al., 2017) have supported the view that performance measures should be derived from corporate strategy. Given that, performance measures should have a strategic focus, Soderberg, Kalagnanam, Sheehan and Vaidyanathan (2011) argue that the direct relationship between performance measures and strategy is a minimum requirement for a CPMM framework.

Business organizations are placing emphasis in achieving strategic alignments through the linkage between their strategy and PMM frameworks (or their components). This is because strategic alignment can promote consistency of both decision-making and action (Pinheiro de Lima, da Costa and Angelis, 2009), and is crucial in the achievement of the organization's overall success (Dossi and Patelli, 2010). In a similar vein, some authors (Upadhaya et al., 2014; Baird, 2017; Yuliansyah et al., 2017) found that organizations making greater use of the CPMM frameworks with strategic alignment are likely to experience improved performance and effectiveness.

Lu et al. (2008) conducted a study on PMM of construction firms and found that performance measures were derived directly from corporate strategy formulation using a strategic map. In a study, Latiffi Carrillo, Ruikar and Anumba (2010) acknowledge the importance of the direct linkage between CPMM and strategy formulation in construction organizations. Soderberg et al. (2011) in another study found a high percentage (74.5 percent) of firms' performance measures were derived from their strategies.

Meanwhile, some authors (Parmenter, 2015; Rao et al., 2018) suggest that performance measures should be derived from the CSFs of an organization instead of strategy. Developing performance measures from CSFs will ensure that organizations focus on their strategic business areas.

Some previous (Neely, Adams and Crowe, 2001; Moxham, 2014; Otheitis and Kunc, 2015; Liu, Love, Smith, Matthews and Sing, 2016) suggest that performance measures should be developed and aligned with the needs of both internal and external stakeholders instead of strategy. It should be noted that Neely et al. (2001) was one of the first to advocate that performance measures should to be derived from the needs and wants of stakeholders.

Furthermore, business organizations can review existing PMM systems/frameworks within related industries to derive the suitable performance measures for their PMM systems/frameworks. Jin et al. (2013) suggest that business organizations should assess some existing conceptual models to determine the performance measures that are more applicable their characteristics and circumstances. Tangen (2004) suggest that business organization should review their existing PMM frameworks to derive their performance measures.

2.5.4 Casual relationships

The cause-effect relationship is an important characteristic of any CPMM framework. A CPMM framework should facilitate the casual relationships between its different components including between different performance perspectives, different performance measures and between the CSFs incorporated in it (Kaplan and Norton, 2008; Silvi, et al., 2015) as well as between the strategic objectives and the performance measures (Norreklit at al., 2012). Furthermore, business organizations can use the strategy maps to specify the cause and effect relationships among the measures within their identified performance perspectives (Barnabè, 2011; Francioli and Cinquini, 2014; Perkins, Grey and Remmers, 2014; Lueg, 2015; Sofiyabadia et al., 2016). Meanwhile, an effective strategy map can provide an expression of the causal relationships between the elements within the perspectives of a CPMM framework. This would enable business organizations to identify their critical measures associated with strategy and objectives, clarify and translate strategy into operational terms, and gain performance improvement (Wang, Wan and Zhao, 2014; Thanki and Thakkar, 2018). Moreover, an effective strategy map will assist business organizations to focus on their strategies in a comprehensive and systematic manner (Wang et al., 2014).

The research evidence on causal relationship between non-financial measures and financial performance measures within a CPMM framework is inconclusive (Bedford et al., 2008). Some prior studies (e.g. Vij and Bedi, 2016) have found a positive relationship between performance measures within a CPMM framework. In contrast, some other authors (Nørreklit, Nørreklit, Mitchell and Bjørnenak, 2012; Francioli and Cinquini, 2014; Seal and Ye, 2014; Porporato, Tsasis and Vinuesa, 2017) found evidence that shows no, or weak or negative relationship between a set of performance measures or perspectives within a PMM framework.

2.5.5 The need for CPMM systems/framework

The PM revolution has caused many business organizations to invest considerable amounts of time, effort and resources into the design and implementation of CPMM systems/frameworks (Koufteros, Verghese and Lucianetti, 2014). This is because a CPMM system/framework has increasingly become a critical and an important component of organizational life (Pedersen and Sudzina, 2012), and is needed to provide useful information for the successfully achievement of organizational goals and objectives (Munir and Baird, 2016). It has been recognized that CPMM system/framework is useful for the effective and efficient management of the business organization (Melnyk at el., 2014) and for organizational adaptation to business environment (Micheli et al., 2011). Furthermore, business organizations need to use CPMM framework to provide accurate and reliable information to their managers and employees to track, evaluate, and manage their own performance (Tung et al., 2011).

Many authors (de Leeuw and van den Berg, 2011; Gomes and Yasin, 2013; Parida et al., 2015) espouse that a CPMM system/framework provides information to support continuous improvement of performance. Eaidgah, Maki, Kurczewski and Abdekhodaee (2016, p.196) suggest that continuous improvement is an ongoing process in an organization that focuses on sustainable improvement and creating higher value for all its internal and external stakeholders. More specifically, a CPMM system/framework can improve organizational productivity and competitiveness (Parida et al., 2015; Rao, Chhabria, Gunasekaran and Mandal, 2018), and improve organizational capabilities (Grafton, Lillis, and Widener, 2010; Franco-Santos, Lucianetti, and Bourne 2012) across three types namely strategic management capability, operational capability, and external stakeholder relations capability (Koufteros et al., 2014). An effective CPMM system provides useful information for decision-making (Taticchi et al., 2012; Silvi et al., 2015). This would ensure that decisions are made from evidence rather than intuition and emotions of managers. Ultimately, CPMM system can contribute towards improving organizational effectiveness (Upadhaya et al., 2014; Willar, Trigunarsyah and Coffey, 2016).

CPMM is interrelated and can be integrated with many different management practices including among others: strategic management, operations management (Bititci et al., 2012); performance management (Radnor and Barnes, 2007); risk management. (Arena and Arnaboldi, 2014) and

financial management. Table 2.1 shows the previously mentioned key management practices in relation to CPMM, which are discussed in the following sections.

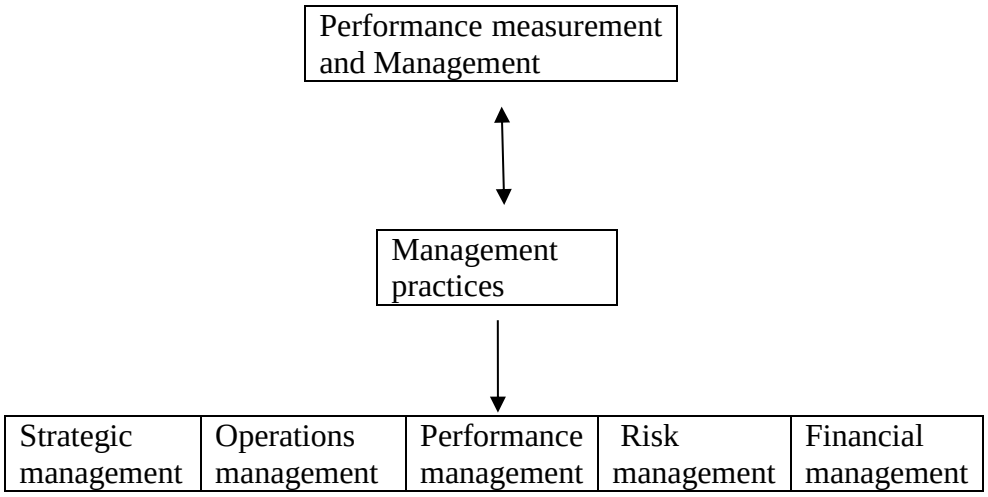


Figure 2.1 PMM and different management practices

The practice of strategic management usually involves strategy development and execution. It varies within business organizations because of the context in which they operate. Generally, the starting point of each PMM system/framework should be strategy development, which involves establishing the organization's mission, strategy, strategic objectives and strategic goals. A CPMM system/framework enables a business organization to measure and manage its performance in line with its defined mission and strategy (Tung et al., 2011). It this way, the business organization know whether its mission and strategy are being executed successfully (de Waal, 2007). It not only allows an organization to clarify, translate, communicate and manage its strategies (Kaplan and Norton, 2001; Neely and Al Najjar, 2006), but it also facilitates the enhancement of strategy development and implementation (Silvi et al, 2015).

Moreover, deploying the strategic measures incorporated in a CPMM framework will provide useful information to support decision-making processes of an organization (Gimbert, Bisbe and Mendoza, 2010; Munir and Baird, 2016; Marchand and Raymond, 2018) and organizational change (MacBryde, Paton, Grant and Bayliss, 2012). Furthermore, a CPMM system supports the implementation and monitoring of strategic initiatives and projects (Aleksander and Armand,

2013; Wieland, Fischer, Pfitzner and Hilbert, 2015). Section 2.6.3.2 provides additional information on strategic management.

Generally, all business organizations that produce goods and/or services are involved in operations management. Stevenson (2012, p.4) posits, "Operations management is the management of systems or processes that create goods and/or provide services". Therefore, operations management should allow business organizations meet their objectives in relation to production of goods and/or services for the marketplace. Site management, contract administration, quality management, and health and safety are fundamental aspects of operations management in construction. Deploying a CPMM system/framework within a business organization can provide information on its day-to-day operations. The performance information generated from the CPMM system/framework can help business organizations control, monitor and continuously improve their operations (Wouters, 2009) and to achieve overall organizational effectiveness (Pinheiro de Lima, da Costa and Angelis, 2009). It can help organizations to manage their operations effectively and keep their employees motivated in achieving organizational success (Pinheiro de Lima, da Costa, Angelis and Munik, 2013). A well-designed CPMM system/framework can be deployed within an organization to establish alignment between business operations and organizational strategy (Hegazy and Tawfik, 2015).

Performance management is an important management practice of any type of business organization (Altin, Koseoglu, Yu and Riasi, 2018). As previously mentioned, performance management is concerned with the use of the information generated from performance measurement (Saunila, 2016, p.165). Pasha (2017) argue performance management consists of three components namely strategic planning, performance measurement, and taking actions based on the information generated through strategic planning and performance measurement. It has been acknowledged that a CPMM system plays a particularly vital role in, and facilitates performance management (Srimai et al., 2011). Specifically, the performance management aspects that a CPMM system/framework supports and improves include managerial development (Ahmad, Zabriz, Omar, 2011) behaviour, motivation, processes, and innovation (Radnor and Barnes, 2007, p. 393) to achieve organizational objectives and success. In addition, CPMM frameworks supports an organization's performance management role of facilitating organizational change and

development (Parida et al., 2015) and organizational learning. Further, the role of PMM framework in the articulation of performance management can include managers tracking and managing their own performance and evaluating employees' performance (Tung et al., 2011).

In recent years, risk management has emerged as an important aspect of organizational life including construction. Risk management is the process that "aims to identify and quantify all risks, to which a business or project is exposed, so that a conscious decision can be taken on how to manage the risks" (Markmann *et al.* 2013, cited in Iqbal, Choudhry, Holschemacher, Ali and Tamošaitienė, 2015, p.67). A typical risk management process includes risk identification, risk assessment, risk analysis and risk treatment (Giannakis and Papadopoulos, 2016). A risk based CPMM system/framework plays an important role in risk management. For example, an effective CPMM system can incorporate risk measures to assess and manage risk within business organizations (Davila, 2012; Arena and Arnaboldi, 2014), and places greater strategic importance on risk management by linking risk management to strategy in order to achieve organizational objectives (Arena and Arnaboldi, 2014). It has been acknowledged that the construction environment especially in developing countries is perceived as risky (Ezeldin and Sharara, 2006, cited in Luu et al., 2008), and therefore, construction firms should incorporate risk measures or a risk perspective within their PMM systems/frameworks to assess their performance. Section 2.6.3.6 of this study presents details discussion on risk management.

The CPMM system/framework uses financial performance measures to perform its traditional role of financial management. Financial management is concerned with decisions relating to the acquisition, financing and management of assets to meet goals and objectives of entity (Van Horne and Wachowicz, Jr. 2009). The financial goals that a CPMM system supports may include achieving profitability, maintaining liquidity and solvency (financial stability) both short term as well as long term, growth in sales turnover and maximizing wealth of shareholders (Bhagwat and Sharma, 2007, p.55). In summary, the focus of financial management of an organization is to make optimal financial decisions with a view of accomplishing its objectives. Upadhaya et al. (2014) suggest that if business organizations are unable to make optimal decisions regarding the efficiently and effectively manage their resources; they may be at risk of suffering financial losses, which could potentially leading to a complete corporate failure. Furthermore, a CPMM

system/framework can help business organizations to contribute to their corporate governance by demonstrating managerial and financial accountability to key stakeholders.

2.6 Lifecycle of CPMM systems/frameworks

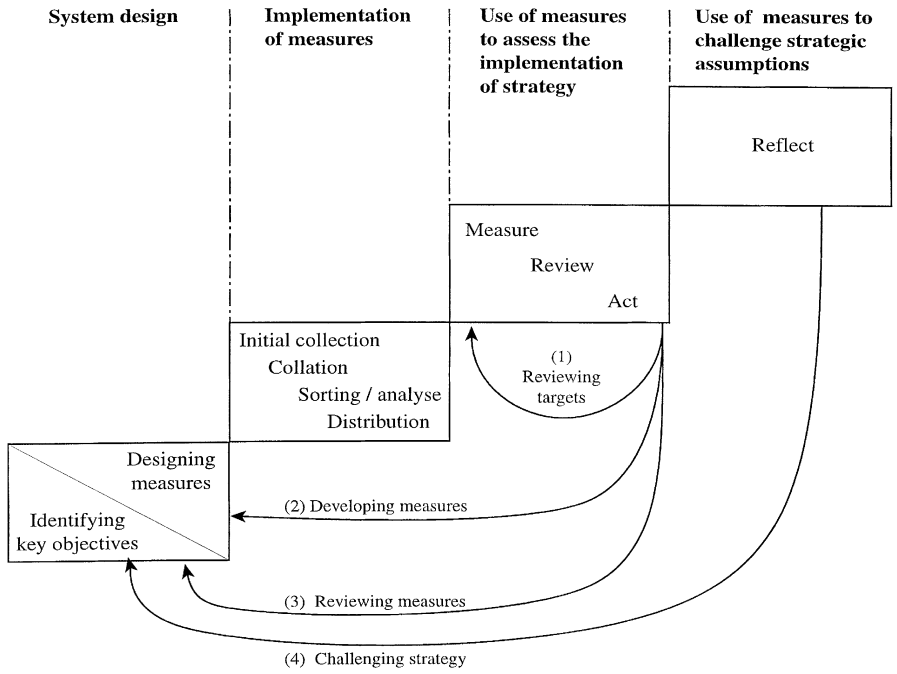
CPMM systems/frameworks can be considered as instruments that undergo a life cycle with four stages, namely design, implementation, use and review/refresh (Bourne, Mills, Wilcox, Neely, and Platts, 2000; Braz, Scavarda, and Martins, 2011; Melnyk et al., 2014; Gutierrez et al., 2015), as depicted in figure 2.2. Bourne *et al*. (2000) posit that the life cycle of a CPMM system/framework is not a simple linear progression from PMM system design to its reviewing stage. The life cycle approach to PMM system provides a systematic way of developing a CPMM system/framework as well as documenting issues pertaining to it. Accordingly, business organizations should focus on understanding the entire lifecycle of their CPMM systems/frameworks. Bourne et al. (2000) point out the business organizations with CPMM systems/frameworks should continuously review them throughout their life cycle in line with new circumstances. In the literature, it was found that more emphasis was given to the design stage of PMM system, compared to the other stages (Luu et al., 2008; Gopal, Jitesh Thakkar, 2012; Gutierrez et al., 2015). Therefore, research with greater attention on other phases of a PMS life cycle is still limited (Braz et al., 2011; Nudurupati et al., 2011; Najmi et al., 2012; Taylor and Taylor, 2013; Gutierrez et al., 2015).

2.6.1 CPMM system design stage

The design stage of PMM system lifecycle is its starting point. A number of authors (e.g. Bourne et al., 2000; Li and Tang, 2009) suggest that the design stage of a CPMM system mainly involves identifying strategy and key objectives, identifying CSFs and defining the performance measures from the objectives and strategy. The design stage of a CPMM system should also identify the needs and wants of the customers and other stakeholders of an organization (Li and Tang, 2009; Braz at al., 2011), and develop a framework to review the final set of performance measures (Gutierrez et al., 2015). Strecker et al. (2012) suggest that management needs to understand the measures and the relationship between the performance measures when designing CPMM systems and frameworks.

2.6.2 CPMM system/framework implementation stage

The implementation stage of CPMM system/framework involves the establishment of systems and procedures for collecting and processing data, and disseminating information that enable the measurements to be undertaken precisely, regularly and reliably (Bourne et al., 2000; Braz et al., 2011). Furthermore, appropriate management information system and human resources are prerequisite for the successfully CPMM system implementation (Nudurupati et al., 2011). During the PMM system implementation (and design), business organizations may encounter many challenges (Wouters, 2009) as well as deploying strategies to overcome these challenges.



Source: Bourne et al. (2000)

Figure 2.2 Design, implementation, and use and update of PMS phases.

2.6.2.1 Enablers and barriers to CPMM system/framework implementation

Several factors emerge from the literature that influence the successful implementation of CPMM system/framework in business organizations. The factors that influence the CPMM system implementation can be classified under two headings, namely internal and external factors (Pedersen and Sudzina, 2012; Oley, 2016). Otley (2016) suggests that the most commonly

observed internal factors are organizational size, structure, strategy, compensation systems, information systems, psychological variables (e.g., tolerance for ambiguity), employees' participation in the control systems, market position, product life-cycle stage, and systems change; whereas the most cited external factors include technology, market competition or hostility, environmental uncertainty and national culture. Similarly, Pedersen and Sudzina (2012) suggest that the internal factors which influence CPMM system/framework implementation include firm strategy, structure, size, organizational politics, management's commitment, resistance to change, organizational culture, etc., whereas external factors include new technology, legislation, intensified global competition, outsourcing, etc. The factors can be enablers/facilitators or barriers/obstacles to CPMM system implementation.

Previous studies (e.g. Akhtar and Mittal, 2015; Gutierrez et al., 2015) reveal that top management support was a significant enabling factor in the successful implementation of CPMM system/framework. In their study, Taylor and Taylor (2013) found that six key enabling factors for the success of CPMM system implementation within an organization were the strategy formulation process, strategy implementation process, information systems support, organizational learning orientation, a quality management culture and senior management leadership.

Meanwhile, the literature identifies barriers that impede the implementation of CPMM systems within business organizations. The barriers to CPMM system/framework implementation can be classified under two types, namely internal and external barriers (Walker and Jones, 2012; Mourad, 2017). With regard to internal barriers, several prior studies (e.g. Khan et al., 2011; Chileshe, Rameezdeen, Hosseini and Lehmann, 2015) have identified lack of top management support as a significant barrier to the successful implementation of CPMM systems. On the other hand, significant external barriers to the implementation of a CPMM framework include political uncertainty and reluctance to adopting new technologies that are suitable for the firms' circumstances (Otley, 2016). Table 2.3 presents both internal and external barriers that inhibit the successful implementation of a CPMM system/framework within business organizations.

Table 2.3 Barriers to implementation of a CPMM system/framework

#	Barriers to the implementation of a CPMM system/framework	Author(s)
	Internal factors	
1	Lack of top management support.	Ahmad et al. (2011); Corbett and Angell (2011);Khan et al. (2011); Tung et al. (2011); Taylor and Taylor (2013); Hwang, Tan and Sathish (2013);Shang and Pheng (2014); Chileshe et al. (2015); Attri, Singh and Mehra (2017); Belhadi, Touriki and El fezazi (2017); Gómez-López, López-Fernández and Serrano-Bedia (2017); Yadav & Desai (2017).
2	Lack of employees' involvement & participation.	Corbett & Angell (2011); Tung et al. (2011); Otley (2016); Gómez-López et al. (2017).
3	Lack of knowledge and understanding of the concept of PMM.	Khan et al. (2011); Forslund (2012); Bashir, Suresh, Oloke, Proverbs and Gameson (2015); Ülgen and Forslund (2015); Belhadi et al. (2017).
4	Ambiguity or lack of understanding of the expected benefits from CPMM framework.	Corbett and Angell (2011); Khan et al. (2011); Bashir et al. (2015).
5	Higher implementation costs.	Khan et al. (2011); Hwang et al., (2013); Metaxas and Koulouriotis (2014); Bashir et al. (2015); Sarhan, Xia, Fawzia, Karim and Olanipekun (2018).
6	Inadequate resources for CPMMF implementation	Corbett and Angell (2011); Hwang et al., (2013); Goh et al. (2015); Kim (2016); Gómez-López et al. (2017).
7	Inadequacy of appropriate IT infrastructure support.	Nudurupati et al. (2011); Taylor and Taylor (2013).
8	Lack of clear strategies &/or strategic alignment.	Khan et al. (2011).
9	Business/firm size.	Khan et al. (2011); Gadenne et al. (2012); Speckbacher & (2012); Taylor and Taylor (2014); Otley (2016).
10	Inappropriate organizational culture.	Talib, Rahman and Qureshi (2011); Mosadeghrad (2013); Shang and Pheng (2014); Talib and Rahman (2015); Aamer, Al-Awlaqi and Alkibsi (2017); Zhang, Narkhede and Chaple (2017); Sarhan et al. (2018)
11	Resistance to change.	Shang and Pheng (2014); Kim (2016); Belhadi et al., 2017); Gómez-López et al. (2017); Sarhan et al. (2018)
	External factors	
1	Low level of competition.	Khan et al. (2011); Otley (2016).
2	Legislation & regulation in the industry.	Pedersen and Sudzina, (2012); Chileshe et al. (2015).
3	Reluctance to adopting new technologies.	Otley (2016).
4	Economic downturn and uncertainties.	Otley (2016).
5	Political uncertainty.	Munir et al. (2012); Otley (2016).
6	Social & ecological uncertainties.	Otley (2016).

2.6.2.2 Strategies to overcome the barriers to CPMM framework implementation

In identifying and understanding the barriers to the implementation of a CPMM framework, managers would be better placed to develop effective strategies to overcome the barriers to the successful implementation CPMM framework (Mosadeghrad, 2013). Similarly, Gómez-López et al. (2017) ague that by identifying, understanding and prioritising the potential barriers, anagers of

interested organizations will be in a better position to anticipate and address the problems that may arise during the implementation process (p.708). As suggested by Willar, Coffey and Trigunarsyah (2015), the strategies to overcome barriers to the successful CPMM framework implementation tend to vary between firms and industries. The literature identifies strategies to overcome barriers to the successful implementation of a CPMM framework within business organizations. It can be deduced from the extant literature that leadership and top management commitment, education and training and supportive culture are the three most important strategies for the successful implementation of a CPMM system/framework within business organizations. Table 2.4 outlines some key strategies to overcome barriers to the successful implementation of a CPMM system/framework within business organizations.

Kim (2016) found that gradual adoption and implementation of the CPMM system/framework could reduce the challenges and barriers to its successful implementation. This implies that lessons learned from the implementation of an initial phase of the CPMM system could be used to improve the implementation of the other phases of the PMM system.

The literature also demonstrates that visualization or visual management can help organizations with implementation a CPMM system/framework. Eppler and Platts (2009, p.43) suggest that visualization is "the graphic representation of data, information and knowledge". The deployment of visual management techniques such as visual maps, tree diagrams, flow charts, visual performance dashboards and cause-and-effect diagrams can help participants to gain insights and understanding of the various aspects of the CPMM system implementation process (Bititci et al., 2016; Eaidgah et al., 2016). In addition to improving coordination, the use of visual management techniques can help to improve both internal and external communication during the implementation of a CPMM system (Eppler and Platts, 2009). Furthermore, it can facilitate cultural change within an organization (Tezel, Koskela, and Tzortzopoulos, 2009; Bititci et al., 2016). Hence, visualization can help to overcome the barriers to implementation of CPMM frameworks within business organizations.

Table 2.4 Strategies to overcome CPMM implementation barriers

#	Strategies to overcome barriers to the implementation of a CPMM system/framework	Author(s)
1	Leadership and top management commitment	Talib et al. (2011); Altayeb & Alhasanat (2014); Mosadeghrad (2014); Willar et al. (2016); Belhadi et al. (2017); Schmidt, Sousa-Zomer, Yadav & Desai, 2017; Andrietta and Cauchick-Miguel (2018).
3	Education and training	Mosadeghrad (2013, 2014); Altayeb & Alhasanat (2014); Shang and Pheng (2014); Azyan, Pulakanam and Pons (2017); Yadav & Desai (2017).
4	Supportive culture for PMM	Mosadeghrad (2013); Goh et al. (2015); Willar et al. (2016), Sarhan et al. (2018).
5	Gaining people's buy-in and involvement in a CPMM framework implementation process.	Northcott and Taulapapa (2012); Singh and Sushil (2013); Mosadeghrad (2014).
6	Appropriate ICT infrastructure	Braz et al. (2011); Nudurupati et al. (2011).
7	Establishment of strategic goals and mission and vision based on the concept of PMM	Altayeb & Alhasanat (2014); Yadav & Desai (2017).
8	Increase accountability throughout the organization	Akbar, Pilcher & Perrin (2015).
9	Aligning rewards to performance measures	Hulthén, Näslund & Norrman (2016).
10	Establishing a dedicated PMM team and allocated resources	Aboelmaged (2011).
11	Appropriate implementation plan	Mosadeghrad, (2013).

2.6.3 CPMM system use stage

Henri (2009, p. 252), defines the use of PMM systems/frameworks as "the way in which the measures are used by managers". Managers of business organizations can use measures within a PMM framework to meet organizational goals and objectives. With respect to the usage phase of CPMM framework, an organization would place emphasis on measuring the success of strategy implementation, and capturing the information and feedback from the measures to discuss and challenge the underlying assumptions about its strategy and business model (Bourne et al., 2000; Basuony 2014) as well as on the entire system. During the CPMM system use stage, it is imperative to update the CPMM system (Braz et al., 2011). The literature identifies various uses of performance measures incorporated in a PMM system/framework, and some of the key uses of performance measures are discussed below.

Some authors (Simons, 2000; Henri, 2006; Widener, 2007; Ferreira and Otley, 2009; Koufteros et al., 2014) distinguish between two types of use of CPMM systems/framework: diagnostic and interactive uses. According to Pešalj, Pavlov and Micheli (2018), diagnostic use of performance measures places emphasis on the achievement of organizational goals and objectives such as meeting budget targets and providing feedback on performance levels achieved. Ferreira and Otley (2009) suggest that diagnostic use of CPMM system follows the mechanistic, repressive, and traditional control approach. Moreover, some authors (Koufteros et al., 2014; Bedford, Malmi and Sandelin, 2016; Pešalj et al., 2018) describe diagnostic use of performance measures as a monitoring activity that tracks and reports progress toward goals, monitors deviations from predetermined standards or levels of performance and focuses on results.

At the other end of the spectrum, the interactive use of CPMM systems takes an organic, constructive, and high learning-oriented approach (Ferreira and Otley, 2009). Moreover, managers use performance measures and targets interactively by regularly involving in decision activities of subordinates to encourage debate, strategic dialogue, learning, identify opportunities as well as continual challenging underlying data, assumptions and action plans with subordinates and peers to trigger change (Bedford et al., 2016; Pešalj et al., 2018). Koufteros et al. (2014) suggest 'interactive' use of CPMM systems is the active and regular involvement of senior managers in actions to orchestrate organizational resources towards competitive advantage. Interactive use of performance measures supports feedforward control, which allows organizations to make predictions of the results at some time in the future that are compared to plans, and achieve control before any deviation from plans actually occurs. Pavlov and Bourne (2011) also express similar views.

Henri (2006) also classifies the use of CPMM system into four groups namely (1) monitoring, (2) attention focusing, (3) strategic decision making, and (4) legitimization. According to Henri (2006):

- Monitoring use of PMM framework is where performance measures are used to provide feedback regarding expectations of, and to communicate with various stakeholders;

- Attention focusing use is where performance measures are used by managers to send signals throughout the organization of their views on organizational objectives, key success factors and critical uncertainties;
- Strategic decision making use is where performance measures provide information to support analytical processes and utilize strategic issues from the analysis of the business environment; and
- Legitimization use is concerned with managers justifying their decisions or actions.

Some other authors (e.g. Grafton et al., 2010; VanVeen-Dirks, 2010; Bisbe and Sivabalan, 2017) distinguish between two types of CPMM system use: the decision-facilitating and decision-influencing uses. The decision-influencing use refers to the use of information by senior management to monitor and assess the performance of employees and their immediate managers, whereas the decision-facilitating use of a CPMM system refers to the provision of information for problem identification (Grafton et al., 2010). Coordination and knowledge integration, management of urgency and management of uncertainty are some core aspects of the decision-facilitating use of CPMM systems/frameworks, whereas motivation of organizational members to achieve goal congruence is a key aspect of decision-influencing role of CPMM systems (Bisbe and Sivabalan, 2017). In their study, Bisbe and Sivabalan (2017) found that business organizations are making more extensive use of decision-facilitating role of CPMM frameworks (specifically for action choices) than the decision-influencing role.

Moreover, Spekle and Verbeeten (2014) classify the use of a CPMM system into three groups as follows:

1. Operational use which is related to operational planning, budget allocation, monitoring processes and provision of related information;
2. Incentive-oriented use which is related to target setting, incentives provision, and rewards. This use will help to align employees goals with the organizational goals; and
3. Exploratory use involves priority setting, strategy management, improvement and learning, policy development and communications.

Meanwhile, Franco-Santos et al. (2007) identify five broad uses of a CPMM system/framework, namely measure performance, strategy management; communication, influence behaviour; and learning and improvement. This study builds upon the usage typology suggested by Franco-Santos et al. (2007) by including managing risks. These six categories are discussed below. In addition, benchmarking, which is subsumed within the six categories, is discussed separately.

2.6.3.1 Measure performance use

The measure performance use of CPMM systems/frameworks involves measuring and monitoring progress towards the achievement of organizational goals, objectives and mission (Franco-Santos et al., 2007; Spekle and Verbeeten, 2014). Moreover, the measure performance use of CPMM systems also enables the business organizations to measure and evaluate performance (Franco-Santos et al., 2007; Schläfke, Silvi, Klaus Möller, 2012; Micheli and Mari, 2014; Goyal and Mishra, 2016). More specifically, it enables business organization to measure performance of its, business units, projects, teams, and individuals. Furthermore, the measure performance use of CPMM systems also supports learning and improvement in the existing work practices of an organization (Groen et al., 2012). Meanwhile, measure performance use is directly related to single-loop learning, which does not question the initial organizational strategies and plans (Atkinson, 2012) as well as to the diagnostic use of performance measures (Ferreira and Otley 2009; Bedford, Malmi and Sandelin, 2016).

2.6.3.2 Strategy management use

The literature has highlighted the importance of using CPMM systems for strategy management. Franco-Santos et al. (2007) suggest that strategy management use of CPMM systems involves planning, strategy formulation/implementation/execution, attention focusing, and alignment, which are now discussed. An important aspect of strategy management use of CPMM systems is planning or strategic planning in order to accomplish organizational goals (Atkinson, 2012; Cheng and Humphreys, 2016). In addition, the strategy management use of CPMM systems requires the business organizations to engage in strategy formulation (Bisbe and Malagueno, 2012; MacBryde et al., 2012) and strategy implementation or execution (Srivastava and Sushil, 2013; Koufteros et al., 2014; Melnyk et al., 2014; Chatha and Butt, 2015; Micheli and Mura, 2017). Very importantly,

business organizations could use CPMM frameworks to promote sustainable governance and ethical management (Noordin et al., 2017).

A CPMM system can play an important strategy management role in business organizations for focusing attention on issues of strategic significance (Koufteros et al., 2014) and on strategic outcomes (Goh et al., 2015). Several studies emphasize the importance of the strategic alignment of CPMM systems, i.e. aligning PMM systems with organizational strategies (e.g. Franco-Santos et al., 2012; Otheitis and Kunc, 2015; Baird, 2017). Additionally, the strategy management use of CPMM systems enables business organization not only to involve in strategic decision-making (Artz, Homburg and Rajab, 2012; Spekle and Verbeeten, 2014; Silvi et al., 2015; Munir and Baird, 2016), but also in managing strategic changes (MacBryde et al., 2012; 2014).

2.6.3.3 Communication use

It is known that communication through a proper medium plays an important role in the life of an organization. It assists in building and maintaining good relationships within the organization and outside organizations. Many authors (Choong, 2014; Micheli and Mari, 2014; Molina, González, Florencio and González, 2014; Hoque, 2014; Francioli and Cinquini, 2014; Wake, 2015; Cheng and Humphreys, 2016; Moullin, 2017) articulate the communication use of CPMM systems for enabling communication among relevant stakeholders. In a similar vein, the communication use of CPMM systems could facilitate both internal and external communications (Kruis and Widener, 2014).

In the context of internal communication, a CPMM system facilitates communication of strategy and goals throughout the organization (Barnabè and Busco, 2012; Modell, 2012; Hladchenko, 2015; Lueg, 2015; Wake, 2015; Moullin, 2017). More specifically, it can assist organizations in communicating their strategy to both managers and staff (Spekle and Verbeeten, 2014) and performance targets and results to staff (Koufteros et al., 2014). Spekle and Verbeeten (2014) suggest that effective communication of strategies through the organization will eliminate ambiguity and confusion about its objectives. Moreover, the CPMM systems could facilitate communication among business units of an organization (Kruis and Widener, 2014). Additionally, CPMM systems play a valuable role in facilitating formal communication between the

headquarters and divisions (Pellinen et al., 2016), and headquarters and subsidiaries (Dossi and Patelli, 2010).

On the other hand, the external communication use of CPMM systems also could help organizations to communicate their strategic goals and policies to their external stakeholders such as external customers, suppliers and the community (Hladchenko, 2015) as well as performance information to them. This would contribute to greater understanding and transparency of their strategy process and performance among external stakeholders (Hladchenko, 2015).

2.6.3.4 Influence behavior use

Several authors (Franco-Santos et al., 2007; Franco-Santos et al., 2012; Gutierrez et al., 2015; Yuliansyah et al., 2017) highlight importance of the influence behaviour use of CPMM systems. Very importantly, business organizations should identify those behavioural factors that have the greatest impact on the use of a PMM framework (Elzinga, Albronda and Kluijtmans, 2009). Franco-Santos et al. (2007) assert that influence behaviour use entails aspects related to rewarding or compensating behaviour, managing relationships and control. In using CPMM systems for influence behavior purpose, organizations can enhance the performance of their employees through compensation and reward (Franco-Santos et al., 2012; Sahoo, and Jena, 2012; Teeratansirikool et al., 2013; Hegazy and Tawfik, 2015; Gomes, Mendes, and Carvalho, 2017)

The influence behaviour use of CPMM systems also could assist business organizations in managing their internal and external relationships. Specifically, CPMM systems can be used to help business organizations in managing relationships among staff and business units and hence intra-organizational relationships (Kunz, 2015). Furthermore, the influence behaviour use is also associated with managing relationships with external stakeholders such as suppliers and customers/clients (Maestrini, et al., 2018).

With regard to the influence behaviour use of CPMM systems, business organizations can control the behaviour of staff by measuring and managing work performed against set goals, targets, and mission. Similarly, the influence behaviour use of CPMM systems can stimulate the desired behaviours of staff that are consistent with and support organizational objectives and sustainable

performance (Hanson, Melnyk and Calantone, 2011; Goh et al., 2015) and hence achieve goal congruence. Jaeger (2017) suggests that it is important that business organizations incorporate performance measures within their staff performance appraisal and objective agreement and review. Some authors (Rasit and Ismail; 2012 Andrade, Mendes and Lourenco, 2017) suggest that the influence behaviour use of CPMM systems could enable organizations to enhance the psychological empowerment of their employees, which can lead to higher creativity and performance. Moreover, psychological empowerment of managers and employees would motivate them to manage and control available resources to reach organizational objectives (Andrade et al., 2017).

2.6.3.5 Learning and improvement use

Gomes et al., (2017) suggest business organizations can use CPMM system for improvement and learning. According to Franco-Santos et al. (2007), learning and improvement use of CPMM systems/frameworks supports the provision of feedback, double loop learning, and performance improvement. Using PMM systems/frameworks in relation to learning and improvement, organizations can obtain timely and useful feedback on progress towards meeting organizational objectives (Speklé, and Verbeeten, 2014). For example, organizations can obtain timely and meaningful feedback on efficiency and effectiveness of on organizational performance (Behery et al., 2014; Hulthén, Näslund and Norrman, 2016). Grafton et al. (2010) went on to further emphasize that CPMM systems can be used for both feedback and feed-forward control in performance evaluation of organizations.

Previous studies provide evidence of the successfully use of CPMM systems for organizational learning (Hall, 2011; Franco-Santos et al., 2012; Pinheiro de Lima et al., 2013; Koufteros et al., 2014). Argote (2011) argues that organizational learning involves the processes and outcomes of knowledge creation, retention and transfer. In the same vein, Wee, Foong and Tse (2014) point out that organizational learning provides the requisite relevant knowledge that enables organizations to achieve sustainable continuous performance improvements in cost, quality, customer satisfaction, profitability and other performance outcomes. The learning and improvement use of CPMM systems can help business organizations to promote double-loop learning or high level learning (Speklé and Verbeeten, 2014). Moreover, Hall (2011) suggest that the CPMM systems

can be deployed within business organizations to facilitate different types of learning processes such single-loop and double-loop learning, exploitation and exploration learning, and so on.

It is widely acknowledged in the literature that a major use of CPMM systems is to provide information for performance improvement (Parida et al, 2015; Gomes et al., 2017; Yuliansyah et al. 2017). Organizational performance improvements include inter alia productivity improvement (Parida et al, 2015; Bhat, Gijo and Jnanesh, 2016), process improvement (Wieland, Fischer, Pfitzner and Hilbert, 2015), operational improvement (Goh et al., 2015) and quality improvement (Northcott and Taulapapa, 2012; Bhat et al., 2016). Furthermore, CPMM system can encourage and improve employee's professionalism at all levels in the organization (Groen et al. 2012). Using CPMM system can help organizations to increase their employees' commitment to improve their work practices and environment, and focus on gaining PMM system improvements by developing improvement ideas and using multiple measures (Wouters, 2009).

2.6.3.6 Managing risk use

Managing risk has been recognized as an important aspect of PMM process for the achievement of project objectives (Hwang, Zhao, and Toh, 2014; Marcelino-Sádaba, Pérez-Ezcurdia, Echeverría Lazcano and Villanueva, 2014) and the overall organizational objectives (Arena and Arnaboldi, 2014). Risk management enables business organizations to identify and manage in a timely manner the significant risks that could affect their success or existence (Falkner and Hiebl, 2015) and then link the identified risks to their strategy (Zhao et al. 2013). With managing risk usage, organizations can incorporate risk measures in their CPMM systems/frameworks to assess and manage risks and place more emphasis on events that can cause variations from the achievement of their objectives (Davila, 2012; Arena and Arnaboldi, 2014). Incorporating performance measures that capture the keys risks that an organization may encounter can enable management to identify, understand and focus on those risks (Perrenoud, Lines and Sullivan, 2014). Business organizations are exposed to many different types of risks. It is important that a business organization identifies and defines its main types of risks for its projects and other requirements (Smart and Creelman, 2013). Some of the main risks that business organizations are exposed to include but not limited to strategic risk (Andersen, 2008), financial risk (Smart and Creelman, 2013; Kim and Vonortas 2014), operational risk (Kim and Vonortas, 2014), and project

risk (Iqbal et al., 2015; Marcelino-Sádaba et al., 2014; Muriana and Vizzini, 2017). These risk types are discussed below.

Strategic risk refers to unexpected events that reduce the ability of an organization to implement its intended strategies and strategic objectives. According to Andersen (2008), strategic risk may emerge from competitor moves, political events, social changes, changing taste, and new technologies. Smart and Creelman (2013) suggest that strategic risks stem from strategic choices made by an organization such as setting objectives, and selection of products and markets. Meanwhile, environmental scanning and strategic planning are important means of monitoring strategic risk of an organization.

Financial risk is the risk relating to the financial aspects of an organization such as financing decisions and exposure to the financial markets. Financial risk within an organization involves the risks emanating from liquidity, credit and the market (Smart and Creelman, 2013). Anton, Rodriguez and Lopez (2011) found in a study that the most significant financial risks that are likely to be encountered by construction projects and organizations include inflation, fluctuation of the interest and currency exchange rates, and lack of financial solvency. The study by Pagach and Warr (2011) found that firms with more volatile operating cash flows and riskier stock returns were more likely to embrace total organizational risk management. An effective assessment of financial controls will help organizations to forecast their financial positions in line with the changing business environment and thereby minimize financial risks.

Operational risk: This risk refers to any unexpected events that affect an organization's every-day activities and the realization of its objectives. According to Raz and Hillson, (2005, cited in Park, 2010, p.42) operational risk can be defined as "the risks associated with losses that may result from inefficiencies or non-conformances within the operational process of an organization, including quality, cost, production, schedule, and manpower". Operational risk consists of risks stemming from processes, people, systems, external events and legal exposure (Smart and Creelman, 2013). Commonly cited examples of operational risk factors include operational disruptions, technological breakdowns, human errors, fraud, legal risks, disclosure risks, etc. (Andersen, 2008, p.158). The emergence of different types of organizations such as business

networks as well the increasing complexities facing organizations may arguably result in an increase in the organizations' exposure to operational risk. In addition to appropriate information technologies, standardization of organizational processes another important way of coping with the exposure to operational risks (Andersen, 2008). Business continuity planning is important process that could be used to cope with operational risk.

Project risk: Given the growing complexity and uncertainty in projects, managing project risk is becoming more critical to project management and ultimately to project success (Liu, Zou and Gong, 2013; Perrenoud, Lines, Savicky and Sullivan, 2017). Project Management Institute [PMI] (2013, p. 309) defines project risk as "an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives such as scope, schedule, cost, or quality". It is important to predict and manage the key risks associated with construction projects in alignment with project objectives including time, cost, quality, safety and environmental sustainability (Zou, Zhang and Wang, 2007; Liu et al., 2013; Qazi, Quigley, Dickson and Kirytopoulos, 2016). In a study, Iqbal et al. (2015) found that the top five risks affecting most of construction projects were as follows: 1) payment delays; 2) project funding problems; 3) accidents/safety during construction; 4) defective design; and 5) inaccurate execution plan/schedule. Liu et al. (2013) found that managing project risk at the firm (enterprise) level could improve its effectiveness of project outcomes.

2.6.3.7 Benchmarking

The management and measurement of performance in business organizations need to identify key areas of organizational value creation and set benchmarks (key performance measures and targets) against which actual performance in these areas is monitored for improvement. They can make use a CPMM system to generate useful information for benchmarking at three levels, namely, project, organization and industry levels (Kärnä and Junnonen, 2016). Benchmarking (BM) involves the process of measuring and comparing the performance of different organizations (external BM) or different business units within an organization (internal BM) with a view to identifying and learning best practice and achieving continuous improvement (Kärnä and Junnonen, 2016). This implies that business organizations can learn about their own organizational practices as well as best practices from others. Ahuja, Yang and Shankar (2010) suggest that

benchmarking process include four phases as follows: (1) benchmarking and bench measurement; (2) bench learning (from the results of benchmarking); (3) bench action; and (4) bench monitoring. It is important that organizations identify contemporary performance measures for benchmarking.

Some authors (e.g. Yeravdekar and Behl, 2017) have proposed benchmarking framework as a type of PMM system/framework to evaluate and improve organizational performance. Whereas, some other authors (e.g. Kärnä and Junnonen, 2016) have considered benchmarking as an important use of a CPMM system/framework, which is now discussed. Benchmarking use of CPMM systems enable business organizations to communicate benchmarking findings to both management and employees in order to increase its acceptance (Adewunmi, Iyagba and Omirin, 2017) as well as to feed the findings into its decision-making process (Adewunmi et al., 2017). Moreover, business organizations can utilize benchmarking information from CPMM systems to seek performance improvement by making the necessary changes to their policies and business practices (Bezerra and Gomes, 2016; Kärnä and Junnonen, 2016; Adewunmi et al., 2017; Shohet and Nobili, 2017). Furthermore, CPMM systems can be utilized by business organizations to provide benchmarking information that could support continuous learning and development (e.g. increase professional and organizational competences) (Kärnä and Junnonen, 2016; Jääskeläinen and Thitz, 2018) and through enhancing customer service and satisfaction of organizations (Kärnä and Junnonen, 2016).

As pointed out by de Castro and Frazzon (2017), benchmarking from an innovative perspective can stimulate organizations to identify and accept the practices adopted by best performing firms with a view to improving their own business practices. It is hope that organizations will achieve excellent levels of performance by adopting the identified best practices from best performing firms. Furthermore, benchmarking identifies the strengths and weaknesses of organizations and provides a point of reference for strategic planning process (Ercan and Koksal, 2016). Ali et al., (2013) argue that benchmarking has been applied within construction firms but they place more emphasis on internal benchmarking.

2.6.4 CPMM review stage

The last lifecycle stage of the CPMM system lifecycle entails its review. It is important that business organizations establish a review framework or procedure to assist them to conduct

reviews of the effectiveness of their CPMM systems (Najmi, Etebari and Emami, 2012; Gutierrez et al., 2015). Furthermore, business organizations should review their CPMM systems as a means of maintaining their relevance with changes in strategy and the business environment (Braz et al., 2011; Nudurupati et al., 2011; Taticchi et al., 2012). CPMM system review may include developing new performance measures and CSFs and disregard those that are irrelevant and supporting ICT review.

Furthermore, Searcy (2011) identifies a three-phase assessment framework that can be used to conduct reviews of the PMM systems/frameworks used by business organizations. According to Searcy (2011, p.49), the three phases of the assessment framework are as follows:

1. Planning for an assessment of a PMM system involves conducting an internal and external environmental scan, developing the purpose and scope of the assessment, and developing an action plan;
2. Conducting an assessment of a PMM system includes preparing for the assessment, conducting the assessment of the PMM system at the specified levels, and conducting the assessment of the PMM systems throughout the specified life cycle stages; ; and
3. Following up on the results of the assessment includes developing recommendations based on the results of the assessment, implementing the adopted recommendations and concluding the review of the PMM systems.

Furthermore, the assessment framework will assist business organizations in identifying the strengths and weaknesses of their PMM systems and key areas for their improvement (Searcy, 2011).

Some authors (Speckbacher, Bischof and Pfeiffer, 2003; Cocca and Alberti, 2010; Soderberg et al., 2011) have suggest that business organizations could take evolutionary approach for the review and development of a PMM system. For instance, Speckbacher et al. (2003) proposed three main types of BSCs that can be used for PMM system assessment/review as follows:

1. Type I BSC is considered as the minimum standard BSC, which comprises both financial and non-financial performance measures and/or objectives clustered into perspectives;
2. Type II BSC includes Type I BSC and description of strategy by using cause-and-effect relationships; and

3. Type III fully developed BSC includes Type II BSC and strategy implementation by defining objectives, action plans, results and linking incentives to BSC.

Similarly, Soderberg et al. (2011) develop a five (5) level taxonomy to classify organizations' PMM systems/frameworks using the BSC framework. The BSC taxonomy proposed by Soderberg et al. (2011, p.693) are summarized as follows:

1. Level 1 BSC – performance measures are derived from the organization's strategy;
2. Level 2 BSC contains at least one of the two structural attributes: balance among measures and causal linkages. It can be Level 2a BSC – Level 1 plus the attribute of balance or Level 2b BSC – Level 1 plus the attribute of causal linkages;
3. Level 3 BSC – Level 1 plus the attributes of both balance and causal linkages;
4. Level 4 BSC contains at least one of the two attributes or uses: double-loop learning, and tie-in to compensation. It can be Level 4a BSC – Level 3 plus the attribute of double-loop learning or Level 4b BSC – Level 3 plus the attribute of linkage to compensation; and
5. Level 5 BSC – Level 3 plus the attributes of double-loop learning and linkage to compensation.

These authors suggest that organizations should focus on moving from the Level 1 Basic PMM framework where performance measures are derived from strategy towards implementing a level 5 - fully developed PMM framework (e.g. BSC) which updates their strategy, supports double loop learning and are linked to employees' compensation.

Furthermore, the literature has suggested that organizations can take the evolutionary approach by using a PMM Maturity Model to review or assess the different phases of the lifecycle of a PMM system. Bititci et al. (2015, p.3065) defines a maturity model as "a matrix of practices that define, for each organizational area, the level of formality, sophistication and embeddedness of practices from ad hoc to optimising". According to AlShathry (2016, p.509), maturity models are a set of criteria or standards that are used by business organizations to assess the level of their process management or management systems. In this study, a PMM Maturity Model encompasses a sequence of distinct maturity levels in relation to PMM within an organization or project.

Vivares, Sarache and Hurtado (2018) suggest that the maturity levels represent a hierarchical progression of activities or performance. At the highest or optimized level of maturity, an organization is considered to have a matured PMM system. Some authors (Bititci et al., 2011; Pekkola, Hildén and Rämö, 2015) suggest that higher levels of maturity is often associated with high levels of organizational performance as well as better PMM practice. Bititci et al. (2012) suggest that many maturity models focus on the design phase of PMM system.

Both academics and practitioners have proposed several PMM maturity models. For example, Garengo (2009) proposed a PMM maturity model for SMEs, which encompasses three maturity levels for a PMM system assessment, namely basic, advanced and excellent. Aho (2012) proposed a PMM maturity model, which entails five (5) maturity levels. Additional, Bititci et al. (2015) proposed a PMM maturity model for business organizations, which encompasses three maturity levels of PMM system, namely basic, intermediate and advanced, against which to assess the overall maturity of an organization's PMM system.

Secundo, Elena- Perez, Martinaitis and Leitner (2015, p.429) suggest that maturity models generally have three main functions as follows: (1) initial appraisal of status quo (i.e. identification of maturity level before introduction of systems or innovations); (2) step-by-step roadmaps on how to proceed; and (3) monitoring the progress within a certain domain.

Some studies have shown that business organizations have used maturity models for different purposes. For example, they can used their maturity models to assess the maturity level of their PMM practices and systems as well as identify potential improvement areas (Aho, 2012; Bititci et al., 2015; Alach, 2017; Vivares et al., 2018). More specifically, Bititci et al. (2015) suggest that PMM maturity models are useful in assessing among others the following: alignment of measures with organizational goals and objectives, redundancy of measures, appropriate definition and formulation of measures, and the use of performance measures. Moreover, business organizations can use PMM maturity models to promote higher levels of organizational learning (Bititci et al., 2015). They also identifies strengths and weaknesses in the PMM system within an organzsation (Marx et al., 2012; Vivares et al. 2018). Furthermore, business organizations can use PMM maturity models for prioritising improvement initiatives.

2.7 Types of CPMM frameworks

The literature has identified various key CPMM frameworks that can be adopted by business organizations to evaluate organizational and managerial performance (Baird, 2017). Some well-known CPMM frameworks include but are not limited to the Balanced scorecard (Kaplan and Norton, 1992), Results and Determinants Framework (Fitzgerald, Johnson, Brignall, Silvestro and Vos, 1991), Performance Pyramid (Lynch and Cross, 1991), Performance Prism (Neely et al., 2001); European Foundation for Quality Management (EFQM) business excellence model (EFQM, 2017). Each CPMM framework its own strengths and weaknesses. A discussion of all the previously mentioned PMM frameworks is beyond the scope of this thesis. Accordingly, the BSC, quality management frameworks, KPIs, EFQM, MBNQA, Performance Prism and KPI framework and are discussed within this section below. The discussion of the selected PMM frameworks is centred on their key features, usefulness, strengths and weaknesses.

2.7.1 BSC framework

The BSC (see figure 2.3) has evolved over time (Sigalas 2015), and is one of the most widely used, universally accepted CPMM framework to evaluate and manage organizational performance (Lueg, 2015; Mehralian, Nazari, Nooriparto and Rasekh, 2017; Rao et al., 2018). The BSC framework has been adopted and implemented in many different organizations and industries worldwide (Valmohammadi and Servati, 2011; Yaghoobi and Haddadi, 2016), including construction. Moreover, the BSC translates an organization's mission and strategy into specific measurable objectives (Smith and Loonam, 2016; Yaghoobi and Haddadi, 2016) and into bottom-level operational actions (Rao et al., 2018). BSC further seeks to translate organizational strategic objectives into a coherent set of performance measures and targets (Moullin, 2017; Porporato et al., 2017), while providing a balanced and broader view from the various perspectives of organizational performance (Perkins et al., 2014; Porporato et al., 2017).

Furthermore, the BSC framework integrates different perspectives of organization to provide a balance between its short- and long-term objectives, financial and non-financial measures, and external and internal performance measures (Smith and Loonam, 2016). Typically, it contains performance measures from four distinct perspectives, namely, financial, customer, internal

business process, and learning and growth to evaluate an entity's performance (Sigalas, 2015; Baird, 2017; Mehralian et al., 2017). The BSC framework attempts to balance the outcomes an organization wants to achieve using lagging performance measures and the drivers of these outcomes using leading performance measures (Smith and Loonam, 2016).

Table 2.3 presents some examples of performance measures of the traditional BSC and Figure 2.2 depicts the BSC framework. The four perspectives are briefly discussed as follows:

1. **Financial perspective** is primarily concerned with measuring the financial performance of an organization (Perkins et al., 2014). This perspective assesses the results of actions of an organization in order to meet the needs of its shareholders (Yaghoobi and Haddadi, 2016). It measures the extent to which an organization's strategy implementation contributes to its bottom line results and improvements (Chiang and Lin, 2009; Kootanaee, Kootanaeee, Hoseinian and Talari, 2013).

2. **The customer perspective of the BSC** considers the outcomes of customers include their acquisition, satisfaction and retention (Antonsen, 2014; Sigalas, 2015; Smith and Loonam, 2016) and customer profitability (Antonsen, 2014). Good customer relationship is critical for the success of a business organization and it can influence customer acquisition, retention and loyalty. In addition to customer relationship, customer acquisition, retention, satisfaction and loyalty are also important CSFs, and therefore management should develop performance measures for them (Venturini and Benito, 2015). Jusoh et al. (2008) suggest that the customer perspective signals the ability of an organization to provide and deliver quality products and services to its customers. In designing a BSC, business organizations must identify and incorporate the requirements of customers within it (Wieland et al., 2015). Laihonen, Jääskeläinen and Pekkola (2014) suggest customer perspective provides reliable information on customer value and the overall success of service operations.

3. **The internal process business perspective** requires organizations to focus on innovation and process improvement in order to deliver the value proposition and satisfy the expectations of customers and other stakeholders (Park, Lee, Chae, 2017). Using this

perspective, organizations would focus on utilizing appropriate internal procedures, methods and practices to improve their internal processes and create value (Mehralian et al., 2017). Kao, Wu and Huang (2017) posit that the internal process perspective usually entail processes for innovation, customer management, operations, and regulations. Furthermore, Anjomshoae, Hassan, Kunz, Wong, and de Leeuw, (2017) suggest that the internal business process perspective of business organizations should place emphasis on three key aspects, namely delivery time and accuracy, sourcing, and resource utilization and efficiency. Hulthén, Näslund and Norrman (2016) argue that business organizations with effective internal business processes are expected to effectively meet their external customers' requirements as well as efficiently allocating their resources.

Furthermore, Kao et al. (2017) suggest that the internal business process perspective should focus on two organizational processes, namely, knowledge management process comprising knowledge acquisition, dissemination, utilization, and creation, and administration process comprising security control and intellectual protection. Some authors (e.g. Sharma and Bhagwat, 2007) suggest that business organizations should identify their core internal processes and competencies that they must excel at and identify performance measures for each of them. Mehralian et al. (2017) suggest that business organizations should continuously excel at improving internal processes in order to adapt to the changes in business environment, in particular rapid technological changes.

4. **Learning and growth perspective of the BSC** intends to supports an organization in developing and improving on its performance by increasing its learning and innovative capability. Accordingly, this perspective helps organizations to assess the performance of their people and infrastructure that contribute towards their long-term growth and improvement (Yaghoobi and Haddadi, 2016). Similarly, Lin (2015) suggests that learning and growth takes account of an organization's intangible assets such as employee skills and capabilities to achieve organizational performance improvement. Furthermore, this perspective focuses on organizational learning and the capabilities of people, systems and procedures to achieve performance excellence in the other perspectives (Jusoh et al., 2008). The learning and growth perspective also involves in encouraging both single loop learning

and double-loop learning within an organization. The learning and growth perspective is concerned with creating an environment that is conducive to organizational change, innovation, and growth (Mehralian et al. (2017).

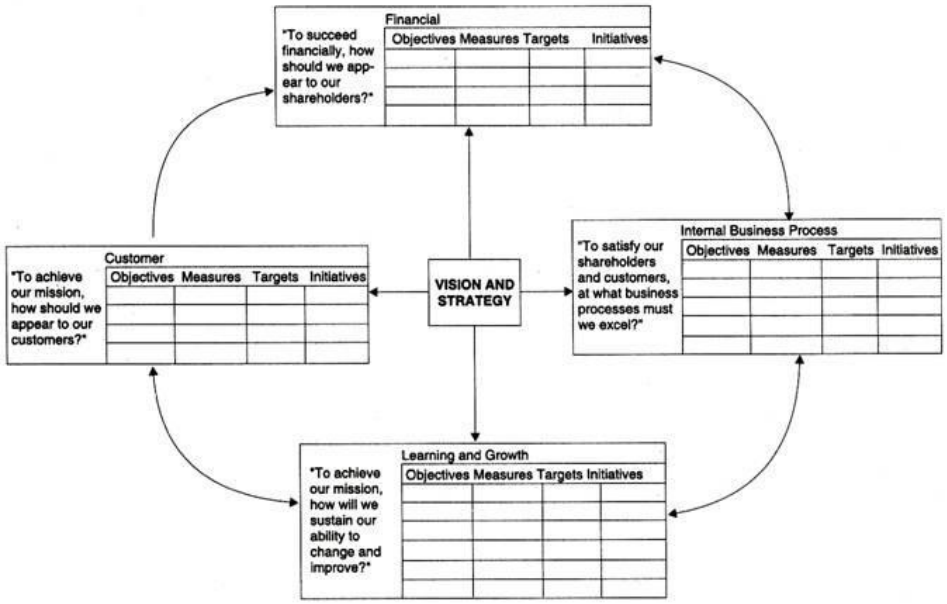


Figure 2.3 Balanced scorecard (BSC) Framework (Kaplan and Norton, 1996)

The BSC incorporates different perspectives that reflect and integrate all interests of key stakeholders (Park et al., 2017). In addition to the four perspectives discussed above, project, supplier and environment and community perspectives are discussed below.

5. **Project perspective:** This perspective is relevant to business organizations such construction firms that are engaged in undertaking projects (or some key aspects of a project life cycle) on a continuous basis to satisfy client/customer needs. Therefore, projects are seen as methods of implementing the business organizations' strategies and objectives. It is imperative that the business organizations measure and manage their projects to ensure the realization of project and organizational objectives. Accordingly, business organizations should identify CSFs and adopt appropriate performance measures (see table 2.5) to assess project performance effectively. It has been acknowledged that CSFs or the key performance areas and related performance measures for projects are

usually based on the firms' expectations and objectives as well as the goals and objectives of the projects (Cha and Kim, 2011; Hwang, Tan and Sathish (2013). Furthermore, project management has been observed as an important CSF of construction firms and hence can create business value for them. Some authors (e.g. Varajão, Colomo-Palacios and Silva, 2017) have emphasized that lack of effective project management is major contributor to project failure.

6. **Supplier perspective:** The supplier perspective requires business organizations to evaluate and monitor suppliers' performance in term of service quality and speed of service delivery, flexibility, and the relationships and partnerships with them. Melnyk et al. (2014) suggest that the effective management of a supply chain can lead to six outcomes as follows: cost reduction, responsiveness, security, sustainability, resilience and innovation.

   Prajogo, Chowdhury, Yeung and Cheng (2012) suggest that buying organizations should continuously monitor and evaluate their supplier performance across multiple dimensions such as quality, delivery, flexibility and cost. Chithambaranathan, Subramanian and Palaniappan (2015, p.312) suggest that flexibility measures include volume flexibility, delivery flexibility, mix flexibility and new product flexibility. Dey et al. (2015) suggest the measurement of supplier performance should consider three important aspects of performance namely quality (of products and services), delivery (schedule) and costing (efficiency in procurement). As part of supplier performance evaluation, several authors have recognized the importance of managing supplier-buyer or supplier relationships to drive organizational performance (e.g. Bemelmans et al., 2012; Forkmann, Henneberg, Naudé and Mitrega, 2016; Maestrini et al., 2018; Hudnurkar et al., 2018).

7. **Environment and community perspective:** The importance of environmental and community perspective and its corresponding measures within CPMM frameworks is growing (Björklund and Forslund, 2013) in order to manage the environmental impact of organizational activities. These authors further suggest that an improvement in community/environmental performance will increase the focus on customers and suppliers, and it is an important source of competitive advantage for business organizations.

Table 2.5 BSC: Perspective, SCFs and performance measures

#	Perspective	Critical success factors	Performance measures
1	Financial	Profitability (Yu et al., 2007)	Return on investment, profit margin (Liu et al., 2015).
		Liquidity Yu et al., 2007)	Current ratio, cash flow level, receivables level (Balatbat, Lin and Carmichael, 2011).
		Growth (Yu et al., 2007);	Pcrofit growth (Balatbat, Lin and Carmichael, 2011); revenue growth rate (Yu et al., 2007; Ali et al., 2013).
		Financial stability Yu et al., 2007)	Debt ratio (Ali et al., 2013), Debt level, interest coverage (Van Horne and Wachowicz, Jr, 2008; Balatbat, Lin and Carmichael, 2011).
2	Customer	Client or customer satisfaction (Jin et al., 2013; Cheng et al., 2014)	Customer satisfaction ratings, number of customer complaints (Ali et al., 2013).
		Customer acquisition (Sainaghi, Phillips and Corti, 2013).	Number of new customers/clients (Chia, Goh and Hum, 2009); customer/client growth; number of improvement suggestions (Niven, 2006).
		Return on customer relationships (Biazzo and Garengo, 2012)	Percentage of repeat customers, relative market share (Ali et al., 2013); organization image (Khan et al., 2011).
3	Internal business processes	Quality (El-Mashaleh et al., 2007; Yu et al., 2007; Rankin, Fayek, Meade, Haas, and Manseau, 2008).	Response time, level of Defect (Ali et al., 2013).
		Process management (Bassioni et al., 2008).	Process time, percentage of expenses to total revenue, tender success rate (Ali et al., 2013) construction productivity rate (Vogl and Abdel-Wahab, 2014).
		Safety ((El-Mashaleh et al., 2007; Rankin et al., 2008; Ali et al., 2013)	Accident level/rate, time loss to accidents, Incident cost (Ali et al., 2013); safety and health audit (Dessler, 2013).
		Risk management (Bassioni et al., 2008).	Number of risk management meetings, risk management responses, risk scores (Kerzner, 2009), risk assessment review (Cameron and Roy Duff, 2007), risk scores for core construction business activities.
4	Learning and growth	Employees/employee development (Yu et al., 2007; Luu et al., 2008).	Employee satisfaction survey (Jin et al., 2013); Employee productivity (Yu et al., 2007);
		Organizational competency (Yu et al., 2007).	Competency coverage ratio, Investment in leadership, Investment in knowledge management efforts (Niven 2006).
		Technology competency (Luu et al., 2008).	Level of IT/ICT application in construction; Investment in IT for construction (Luu et al., 2008). Level of informatization (Yu et al., 2007); Percentage of employees using computers in construction.
5	Supplier	Supplier (and partnership) management (Bassioni et al., 2008).	Materials return rate, supplier on-time delivery, quality of purchased goods (Halman and Voordijk, 2012). Innovative suggestions (Govindan, Shankar, and Kannan, 2018), flexibility (Chithambaranathan, Subramanian and Palaniappan, 2015).
6	Project	Project management (Cserháti and Szabó, 2014).	Safety, cost, time, quality, client's satisfaction (Yeung et al., 2013). Project profit margin, productivity rate, client satisfaction, project safety (Marzouk and Gaid, 2018)
7	Environment & community	Sustainability (Jin et al., 2013).	Energy and water consumption, waste and scrap level, contribution to the community (Parmenter, 2015).

Very importantly, the BSC contributes towards the cause-and-effect relationship between and within the various performance perspectives (Perkins et al., 2014; Baird, 2017). As previously mentioned, business organizations can use strategy maps to link together their performance measures across the different perspectives (Perkins et al., 2014; Lueg, 2015). This cause-effect relationship between performance measures has been supported to some extent in the literature, however it has also been challenged (or rejected) in some studies (Norreklit et al., 2012; Francioli and Cinquini, 2014; Seal and Ye, 2014; Porporato et al., 2017). On the same note, Speckbacher et al. (2003) found that business organizations have implemented the BSC without considering the full cause-effect relationships between the performance measures.

As advocated by many authors (e.g. Behery et al., 2014; Molina et al., 2014), the BSC helps business organizations to align financial and non-financial performance measures with their strategy. In a similar vein, the BSC can assist organizations to monitor their performance in line with their strategy and vision (Mehralian et al., 2017). Meanwhile, some studies reveal that not all performance measures in a BSC could be linked to strategy in practice (e.g. Ittner, Larcker and Randall, 2003). As a comprehensive management system, the BSC helps business organizations to communicate and implement strategy (Khan et al., 2011; Valmohammadi and Servati, 2011; Hladchenko, 2015; Molina et al., 2016). Business organizations can deploy the BSC to evaluate and manage performance (Yaghoobi and Haddadi, 2016; Anjomshoae, Hassan, Kunz, Wong and de Leeuw, 2017). They can also deploy BSC to facilitate decision-making towards achieving their strategies and objectives (Hoque, 2014), and for management and organizational change (Barnabè, 2011; Pimentel and Major, 2014).

Lueg (2015, p.35) suggests that the BSC provides organizations a comprehensive view of their business model, and helps managers focus on what really matters to the organizations' business model by using a set of suitable measures. Yaghoobi and Haddadi (2016) provide similar view. Yaghoobi and Haddadi (2016) further suggest that the BSC enables an organization to improve on its performance at all levels and across all organizational units. The BSC is also useful in project management (Awadallah and Allam, 2015), by allowing project managers to track the progress of projects throughout their life cycle. The BSC could provide business organizations with a framework for ongoing dialogue and conversation about performance (Pešalj et al., 2018).

Despite its popularity and usefulness, the BSC, however, has some potential limitations that should be noted if it is to be effectively implemented and used within business organizations. A main weakness of the BSC is that it is considered a top-down performance management approach (Nørreklit et al., 2012), which limits the contribution and involvement of employees in the strategy process within organizations. Some authors (Nørreklit et al., 2012; Francioli and Cinquini, 2014) argue that the cause-effect relationship between and within BSC perspectives is overly simplistic, ambiguous, dangerous and are not well understood, and consequently will mislead management. Furthermore, the BSC framework lacks a formal implementation methodology (Chiang and Lin, 2009). This may cause its implementation to vary among organizations (Norreklit and Mitchell, 2014), and may lead to its partial implementation.

Another weakness is that the four perspectives of the BSC could ignore some critical stakeholders, and aspects of an organization and its value chain (Barnabè, 2011), and are based on impressions rather than reasoning (Nørreklit et al., 2012). In light of these potential limitations of the BSC, it has still gain broad acceptance among academics and practitioners, and is widely used within organizations worldwide.

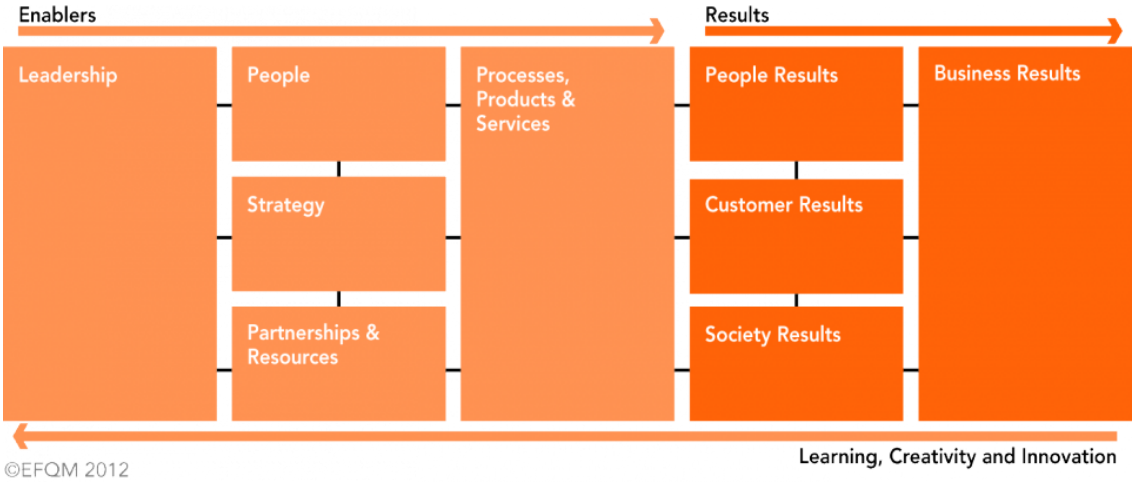
2.7.2 Quality Management frameworks /Models

Many organizations have adopted quality management frameworks/models or are using frameworks that make use of quality management philosophy to pursue performance excellence and continuous improvement. Some of the most popular QM models include Business Excellence Models (BEMs), Total Quality Management (TQM), Six Sigma, Lean, among other. The two most widely adopted BEMs are European Foundation for Quality Management (EFQM). Business Excellence Model developed for European firms and Malcolm Baldrige National Quality Award (MBNQA) was developed in the USA to allow organizations to assess and improve their performance. These Business Excellence Models are used for quality awards (Gómez-López et al, 2017) and have gained much attention in the last 10 years (Bassioni, Price and Hassan, 2008), which are discussed in the following sections below.

2.7.2.1 European Foundation for Quality Management (EFQM) Excellence Model

The EFQM Excellence Model, which is widely used in Europe, was developed in the UK in 1988 to enable organizations to improve their competitiveness and effectiveness. The EFQM Excellence Model can be used for "enabling an organization to gain a holistic overview of their current level of excellence and prioritize their improvement efforts to maximize their impact" (EFQM, 2017, p.7). This BEM, which uses nine criteria (success factors) of performance, is illustrated in Figure 2.4. Five of these criteria are '*enablers*', which measure what an organization does, and how it does it, and four criteria are *'results'* measuring what an organization achieves (EFQM, 2017). Leadership, people, strategy, partnerships and resources, and processes, products and services are the five '*enablers*' criteria; while people results, customers results, society results and business results are four '*results*' criteria of the Model (EFQM, 2017). These criteria are interconnected and intend to cover all aspects of performance in an organization (Belvedere, Grando and Legenvre, 2016; Lasrado and Uzbeck, 2017). The arrows in the figure 2.4 highlights the framework's dynamic nature, showing learning, creativity and innovation could facilitate improvement of the enablers, which in turn lead to improved results (EFQM, 2017).

Gómez-López et al. (2017, p.697) suggest that the EFQM model has three important uses in business organizations. (1) It provide feedback and use it to improve the quality management of an organization, (2) It can used as a self-assessment tool, which allows the organization to assess its strengths and areas in which improvements can be made and culminates in planned improvement actions and (3) It can be used for the Quality Awards. As suggested by Rusjan (2005), EFQM Excellence Model is a non-prescriptive framework that permits many approaches for achieving sustainable organizational excellence and for carrying self-assessment. Lasrado and Uzbeck (2017) suggest that the EFQM model could be adopted for assessing how an organization progress across these nine (9) criteria to achieve excellent performance. It allows benchmarking of an organization against competitors' and industry performance in order to identify opportunities for performance improvement (EFQM, 2015). The EFQM provides common language for the management and employees of the organization (Dahlgaard et al., 2013).



Source: adopted from EFQM (2016).

Figure 2.4 EFQM Business Excellence Model

The strengths of the EFQM model are as follows. It provides a structured approach for obtaining objective feedback information on an organization's strengths, threats and opportunities for improvement (Araújo and Sampaio, 2014; Doeleman, Have and Ahaus, 2014). In addition, the adoption of EFQM Business Excellence Model helps organizations to engage in sharing knowledge, experiences and best practices, and thereby supports organizational learning (Dahlgaard et al., 2013). It helps organizations to plan their journey toward business excellence and to create greater awareness of quality and continuous improvement among their members (Lasrado and Uzbeck, 2017). The study by Rusjan (2005) found that EFQM Excellence Model provides an appropriate structure for identifying and analysing problematic situation within an organization, which includes the description of the present situation and identification of deviations of the present situation from benchmarks (p.378).

Meanwhile, the literature has identified some weaknesses of the EFQM Excellence Model. Yadav-Sushil and Sagar (2013) argue that the EFQM framework does not take the dynamics of changing external environment into consideration due to its lack of maintenance. According to Further, Jaeger and Matyas (2016), the EFQM model (and other excellence models) has not been scientifically verified. Meanwhile, Striteska and Spickova (2012) identify five weaknesses of this model. They include (1) it does not prioritise areas of improvement; (2) performance criteria not specific to a company; (3) it is not a strategic management tool; (4) not suitable for enterprise

communication; and (5) it tends to encourage and support bureaucracy and (5) does not give instructions for designing and conduct effective performance measurement and management.

2.7.2.2 Malcom Baldrige National Quality Award (MBNQA)

The MBNQA framework, which was developed in 1987, comprises the criteria, the core values and concepts, and the scoring guidelines (National Institute of Standards and Technology, NIST, 2017). The criteria for performance excellence consists of the organizational profile and seven integrated, interconnected categories, which have evolved over time (NIST, 2017). The categories represent seven critical aspects of organizational performance. The categories include: (1) leadership; (2) strategy; (3) customers; (4) measurement, analysis and knowledge management; (5) workforce; (6) operations; and (7) results (NIST, 2017). Organizational profile articulates important information on the organization such as its environment, relationships, and situation (NIST, 2017). Business organizations can adopt the MBNQA framework as a performance self-assessment tool and accordingly countries have adopted it for National Quality Awards (Oyewobi et al., 2015). Figure 2.5 shows the Malcolm Baldrige National Quality Award (MBNQA) framework.

The MBNQA framework has been useful to organizations. It enables organizations to delivery continuous improvement and value to customers (Dror, 2008), and provide an opportunity to design-in quality on an organization-wide basis (Lam et al., 2008). The MBNQA framework facilitates the sharing of information on successful strategies for performance excellence (Oyewobi et al., 2015). Accordingly, the MBNQA framework can cultivate an organizational culture towards performance excellence and competitiveness improvement (Dahlgaard et al., 2013; National Institute of Standards and Technology, NIST, 2016). Furthermore, the study of Link and Scott (2011) found the Baldrige Program creates great value for the U.S. economy.

Despite these strengths, the study acknowledges some limitations to the MBNQA framework. Oyewobi et al. (2015) suggest that research evidence shows weak association between MBNQA Model and financial performance, and the award criteria are static and do not keep pace with change of events within the business environment.

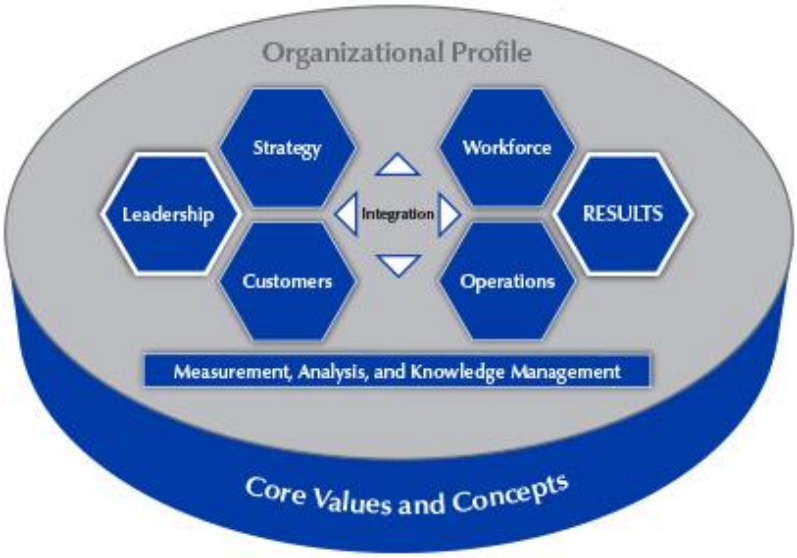


Figure 2.5 Malcolm Baldrige National Quality Award (MBNQA) Framework (NIST, 2016)

2.7.2.3 Other contemporary QM systems/frameworks

Business organizations have applied several other quality management models to evaluate their performance including but not limited to Total Quality Management (TQM), Six Sigma, and Lean. These models are briefly discuss below.

2.7.2.3.1 Total Quality management

Quality has been recognized as a vital aspect of an organization's success. Accordingly, total quality management (TQM) was developed as another management approach to focus of quality in the management of the resources and activities of organization. According to Mosadeghrad, (2014, p.), TQM is a systematic methodology that:

> Aims to enhance customer satisfaction and organizational performance through providing high-quality products and services through the participation and collaboration of all stakeholders, teamwork, customer-driven quality and continuously improving the performance of inputs and processes by applying quality management techniques and tools.

This implies that entire organization and its key stakeholders should be involved the TQM process in order to successfully achieve its objectives and gain competitive advantage. Collier (2013) suggests that TQM is a management approach that an organization can use to focus on customer and continuous improvement in its activities and processes through a systematic approach to

quality management and the commitment of all its members. Aamer, Al-Awlaqi and Alkibsi (2017) suggest that TQM methodology requires a total organization approach to improve the quality of products and services and achieve business excellence. Some key features of TQM model include getting things right from the outset; minimize corrective actions; monitoring customer reaction, and design products and services with quality in mind (Collier, 2013). Lau, Tang and Li (2015) suggest that TQM is a crucial element for the successful management of construction firms and projects. However, the achievement of delivery of high quality projects would require a significant cultural change within the construction industry.

The literature has highlighted several potential benefits that can be derived from the successfully and use of TQM methodology within business organizations. Business organizations can apply TQM model to improve inter alia quality, productivity, efficiency, employee morale and performance, and to instil a quality improvement culture within the organization (Aamer et al, 2017). In the same vein, Kumar, Garg and Garg (2011) suggest that TQM can be used in organizations to improve product quality, teamwork, productivity, profitability, market share and competitiveness and customer satisfaction. One major weakness of TQM model is that it is a top down management approach. A further weakness of operationalizing TQM model is that its implementation costs can be high.

2.7.2.3.2 Lean model

Lean model is another quality management approach that was developed by Toyota Automobile company in Japan where emphasize was placed on cost effectiveness and competitiveness. In the late 1980s, many business organizations, in particular manufacturing firms in Europe and USA have adopted lean methodology as a cost reduction method. Now many other organizations throughout the world have adopted lean model to encourage cost reduction and improve cash flows and profits. The lean model is a quality management philosophy that can be used to minimize or even eliminate different forms of waste or non-value added activities with a process (Antony, Bhuller, Kumar, Mendibil and Montgomery, 2012, p.940). The aim of lean methodology is to achieve highest level of work quality with shortest lead time and lowest cost possible (Al-Aomar, 2012, p.302). Lean methodology assists in improving organizational performance by focusing on eliminating waste from processes and maximising value to clients. Therefore, lean methodology

directs business organizations to focus on two key processes, namely (1) elimination of all waste and non-value activities and (2) continuous improvement. Multi-skill employees are necessary for the success application of lean methodology.

Recently, lean methodology has been embraced by the construction industry to improve its performance and competitiveness, which is called lean construction (Issa, 2013; Khaba and Bhar, 2017; Sarhan et al, 2018). Many authors (e.g. Khaba and Bhar, 2017; Sarhan et al, 2018) suggest that lean construction would assist construction organizations to better utilize their resources in improving their competitive advantage, productivity and meet customers' expectations. Furthermore, Issa (2013) suggests that lean construction methodology could assist construction organizations to minimize their risks effect on project construction time.

2.7.2.3.3 Six Sigma

Six Sigma is a PMM framework that was developed within Motorola just after the mid-1980s and was adopted by business organizations for improvements in quality and business processes (Ismyrlis and Moschidis, 2013; Schmidt et al., 2018). Anthony (2012) defines Six Sigma methodology as a systematic approach for removing defects from products, processes and transactions (p.691). The focus of applying a Six Sigma model within organization is to reduce variation and defeats within a business process and thereby achieve process robustness (Antony et al., 2012, p.940). Furthermore, it aimed at achieving predictable process results.

Some authors have identify five steps or phases to implement Six Sigma for process improvement and they are DMAIC—Define–Measure–Analyze–Improve–Control (Shankar, 2009; Schmidt et al., 2018; Smętkowska and Mrugalska, 2018). According to Shankar (2009) and Smętkowska and Mrugalska (2018), each phase is briefly described as follows:

1. Define – defining the problem and develop a project plan;
2. Measure – data collection, quantify the problem, identify and measure the key processes;
3. Analyse – analysis of data and the results to identify the causes of the problem;
4. Improve – develop and implement changes and sustainable solutions;
5. Control – continuously monitor changes and the results, resolve problems, monitor key performance measures.

Some strengths of Six Sigma include it focuses on quality improvement, it is customer focus and it is a data driven methodology (Antony, 2012). Further advantages of deploying sigma six within organizations are that it can provide a deeper understanding of their business processes and customer requirements. Some weaknesses of Six Sigma include high costs of implementation, a top-down management approach and requires a good level of statistical knowledge to apply (Antony, 2012).

Recently, some business organizations have integrated Lean and Six Sigma concepts, resulting in Lean Six Sigma to achieve improvements in terms quality, speed, customer satisfaction, and costs, among others (Brkic and Tomic, 2016).

2.7.3 Performance Prism

Neely et al., (2001, 2002) proposed the performance prism as a PMM framework to evaluate the performance of business organizations. According to Adams and Neely, (2000) and Neely et al., (2001, 2002), a performance prism (see figure 2.6) is a PMM framework that helps to manage an organization's performance from five main interrelated facets and each facet has its own question to be answered, as follows:

1. Stakeholder Satisfaction: Who are the key stakeholders of the organization, and what are their wants and needs?
2. Stakeholder Contribution: What does the organization want and need from its stakeholders?
3. Strategies: What strategies the organization have to put in place to satisfy the wants and need of its key stakeholders?
4. Processes: What processes does the organization need to put in place to execute the strategy?
5. Capabilities: Which capabilities does the organization need to operate its processes effectively and efficiently?

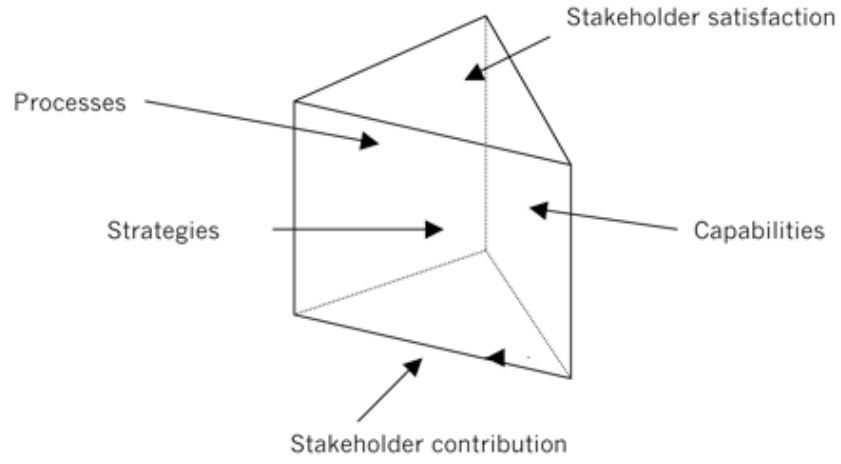


Figure 2.6 Performance Prism (**Neely et al., 2001)**

Each facet is briefly discussed below.

Facet 1: Stakeholders' satisfaction

The first facet of the performance prism focuses on the satisfaction of stakeholders. Business organizations exist to deliver 'value' and satisfy their key stakeholders, which may include investors, customers, employees, suppliers, regulators, pressure groups, among others (Neely et al., 2002). The different stakeholder groups of a business organization will define value in terms of their wants and needs (Neely et al., 2002) and the organization will have to understand and take them in consideration as far as possible. Thus, the role of mangers should be to strive to achieve organizational goals, while satisfying the needs and wants of multiple stakeholders simultaneously or independently (Upadhaya et al., 2014). At the heart of performance prism is the deep-rooted commitment to meet the satisfaction of every relevant stakeholder of the organization. Thus, the performance prism can help organizations to take a stakeholder-centric stance on PMM and therefore to focus on meeting the expectations of relevant stakeholders (Anderson, 2007, p.126).

Facet 2: Stakeholders' contribution

Performance prism identifies and supports the contribution that stakeholders make towards the creation of value in a business organization. White (2004, p. 26) suggest that each stakeholder of a business organization is capable of contributing value to its products or services in return for a

reward, which comes in various forms. For example, an organization wants employees to provide goods or services at an appropriate level for an exchange of compensation packages (e.g. rewards). Meanwhile, customers expect that the organization will offer good quality products or services at reasonable or low price (Upadhaya et al., 2014). Very important, business organizations would usually want sales, profits and loyalty from their customers. Accordingly, some business organizations are performing customer profitability analysis and retention analysis to help them maintain focus on profitable customers. Furthermore, business organizations attempt to maintain good relationships with key stakeholders and their supply chains as a means of enhancing shareholder value (Neely et al., 2002) and other stakeholders' value.

Facet 3: Strategies

The strategies are the route that the organization will follow in order to deliver stakeholder satisfaction (Neely et al., 2002). The starting point of strategy development can be the identification of the wants and needs of the relevant stakeholders (Neely et al., 2001, 2002). It is imperative that the organization attempts to analyze and prioritise stakeholder satisfaction in the strategies it develops to deliver the requisite stakeholder 'value' (Neely et al., 2002). In this case, strategy can be viewed as a political process, where the strategy emerges from bargaining, compromise, interplay and the exercise of power among the relevant stakeholder groups (White, 2004) in order in increase value to them. Accordingly, the developed strategy has to reconcile the different strategic interests and satisfaction of the relevant stakeholder groups (White, 2004). Importantly, White (2004, p.11) further asserts that strategy is increasingly concerned with directing and mobilizing resources into the most critical areas or processes of the organization.

Facet 4: Processes

Business organizations should design and align their underlying critical processes to their chosen strategy in order to accomplish success (Neely et al., 2002). These authors further suggest that processes are essentially cross-functional (and inter-organizational) areas of the business, representing the blueprints for: what work is done, and where, when, and how it will be executed. Neely et al. (2002) suggest that the majority of organizations can have four distinct processes as follows: develop new products and services, generate demand, fulfill demand, and plan and manage the organization. According to Najmi et al. (2012, p.1135), "processes are the

organization's tools for meeting the stakeholders' needs". This implies that, in using the performance prism, managers of organizations should identify and focus attention on the most significant processes that would improve value to stakeholders.

Facet 5: Capabilities

Performance prism supports the organizational capabilities, which would ensure that their processes are functioning efficiently and effectively in order to create value for their stakeholders (Neely et al., 2002). Organizational capabilities comprise the combination of four core components, namely (1) the people, (2) practices, (3) technology and (4) infrastructure that enable organizations to operate their business processes (Neely et al., 2001, 2002). Similarly, Pedersen and Sudzina (2012) suggest that organizational capabilities consist of four distinct dimensions, namely (1) skills and knowledge base, (2) managerial systems, (3) technical systems (e.g. databases and procedures), and (4) values and norms. There is consensus that capabilities supported by such a PMM framework can influence all aspects of organizational life and actions (Marchand and Raymond, 2018), in particular strategy and performance. Meanwhile, a business organization can carry out an audit of its strengths and weaknesses in order to identify its key capabilities, competences, and areas that need improvements.

Using the strategic map, the performance prism can align and integrate an organization's strategies, processes and capabilities with the delivery of stakeholder satisfaction and contribution (Neely et al., 2002). Improvement in stakeholder satisfaction will depend on upon improvements in other four facets of stakeholder contribution, strategies, processes and capabilities. Management needs to develop a comprehensive set of suitable performance measures for each of the facets or stakeholders of the organization (Neely et al., 2001). The organization's measures should be connected with each other through sets of casual relationships, thereby encouraging behaviours that are consistent with and supportive of its strategy (Neely et al., 2002). The measures in the performance prism should focus on critical issues and areas of performance (Najmi et al., 2012). This will provide important insight to drive improvements in business performance (Neely et al., 2002), and to permit managers to take appropriate decisions and actions (Adams and Neely, 2000). The performance prism integrates external (stakeholder) measures and internal (strategy, process and capability) measures.

It is important to develop relevant performance measures and targets for the performance prism facets or perspectives, which should taking into consideration the specific characteristics of the business organization and its industry. The performance measures will allow the business organization to know how well each of the perspective is doing in relation to meeting its set targets and objectives. Table 2.6 shows some examples of performance measures for each of the five perspectives of the performance prism.

Table 2.6 Performance measures of a Performance Prism

#	Facets/perspectives	Performance measures
1	Stakeholder satisfaction	Satisfaction rate (for each stakeholder) Rate of users with improvement of the Quality of Life Index Number of customer complaints
2	Contribution of Stakeholders	Participation rate in satisfaction surveys Number of improvement suggestions Effectiveness of the Training Plan Level of professional performance
3	Strategies	Annual Activity Plan compliance rate Achievement rate of organizational goals Effectiveness rate of improvement actions
4	Processes	Number of non-conformities detected in audit or follow-up report Number of training hours/number of planned training hours Rate of activities compliance of the users' individual plans
5	Capabilities	Financial autonomy/capacity Number of employees /number of required employees Level of competences of the established plan/level of competencies required Policy effectiveness rate Assessment of working conditions

Source: Estrada, Sousa and Lopes (2017, p.858)

Furthermore, performance prism can act as a mechanism for guiding the long-term success and viability of an organization within the business environment (Neely et al., 2002). Some authors (e.g. Kaplan and Norton, 2008, Kaplan, 2012; Molina et al., 2014) claim that an organization should first formulate its strategy, which is then used to develop performance measures of the performance prism. In contrast, Neely et al. (2001) argue that organizations should first consider the wants and needs of stakeholders and subsequently develop their strategies from stakeholders' wants and needs. Adams and Neely (2000) identify four espoused benefits in the application of the performance prism within organizations. They are as follows: (1) it makes stakeholders the locus of designing performance measures; (2) it permits the identification of critical success factors and their associated measures; (3) it emphasizes generic business processes of the organization as the

foundation for value creation; and (4) it places emphasis on integrating and leveraging the combined organizational capability components.

The strengths of this model are as follows. The performance prism focuses on meeting the needs and wants of a wide group of stakeholders and their contribution to organizational performance (Nudurupati et al., 2007; Rao et al., 2018). Anderson and McAdam (2004) suggest that the performance prism provide a balanced picture of organizational performance, highlighting external and internal measures, financial and non-financial measures, and measures of efficiency and effectiveness. It recognizes both stakeholder satisfaction and stakeholder contribution to the success of an organization (Neely et al., 2001; Anderson, 2007). A major strength of this Performance Prism framework is that it allows a business organization to first question and challenge its existing strategy before the process of selecting measures (Tangen, 2004). Furthermore, the performance prism can assist organizations to implement planned organizational change efforts (Smulowitz, 2015).

Despite its usefulness and strengths, the performance prism has some potential limitations that should be noted. Performance prism does not show how the performance measures are going to be realized (Tangen, 2004). It provides little guidance for the actual selection and implementation of the selected measures as well as little or no consideration to the existing PMM systems that business organizations may have in place already (Rao et al., 2018). Furthermore, it lacks a review procedure to maintain its relevance and effectiveness in the changing business environment (Najmi et al., 2012).

2.7.4 Key Performance Indicators (KPIs)

Constructing Excellence (2018)[1] defines a Key Performance Indicator (KPI) as "the measure of performance of an activity that is critical to the success of an organization". This definition is similar to that of CSF. Parmenter (2015, p.7) refers to Key performance indicators (KPIs) as "those indicators that focus on the aspects of organizational performance that are most critical for the current and future success of the organization". Similarly, Kärnä and Junnonen, 2016, p.2094)

[1] http://constructingexcellence.org.uk/kpis-and-benchmarking/

defined KPIs as “performance standards that focus on factors critical to the success of an organization or project”. Business organizations can use a KPI framework or set of KPIs to evaluate their performance against industry benchmarks, target areas for improvements, and improve their performance (Constructing Excellence, 2018). Typically, the KPI framework incorporates KPIs and associated performance indicators or performance measures to enable firms to assess their organizational or project performance. In a similar vein, past research studies on KPIs have attempted to establish a relatively comprehensive list of KPIs to undertake performance evaluation (Lavy, Garcia, Scinto and Dixit, 2014). Meanwhile, KPIs have been included within other well-known CPMM systems such as the BSC for performance evaluation and comparison (e.g. Wang et al., 2014; Piotrowicz and Cuthbertson, 2015). In using the KPI framework, managers of business organizations should gain a good understanding of their key impact areas and incorporate an appropriate set of KPIs and associated performance measures within framework that are relevant to their strategy.

It is believed that KPI was first introduced in the manufacturing sector prior to the mid-1980s, but now has evolved over time and now has been deployed in both the private and public sectors. In the UK, Key Performance Indicator (KPI) programme was initially established by the government through the Construction Best Practice Programme in 1998 to provide a basis for measurement for and benchmarking projects and organizational performance within the construction industry (The-KPI-Working-Group 2000). This was a direct response to Egan’s Rethinking Construction report (The-KPI-Working-Group 2000). The KPI programme provides a set of KPIs to measure and benchmark the performance of construction firms and offers support and guidance for the performance measurement process. In 2003 the Constructing Excellence was established when several bodies merged including the Construction Best Practice Programme (CBPP) to continue with the development of KPIs and accomplish further continuous improvement and demonstrate excellent within the construction industry (Constructing Excellence, 2018).

Recently in the UK, the framework for Construction Industry KPIs contains three set of KPIs to enable firms to assess and benchmark their performance against their peers in the industry, namely economic performance, workforce (respect for people) and environmental performance

(Constructing Excellence, 2017). Each KPI has one or a few performance measures. The three sets of KPIs are outlined as follows (Constructing Excellence, 2017):

- Seven Economic KPIs for all construction, which include client satisfaction, contractor satisfaction, defects-impact on hand over, cost predictability, time predictability, profitability and productivity;
- Ten Respect for people KPIs for all construction, which include staff turnover, sickness absence, safety, working hours, qualification and skills, training, investors in people, staff loss, construction skills certification card and make-up of staff;
- Four Environmental KPIs for all construction, which entail energy use, mains water use, waste and commercial vehicle movements.

This study classifies KPI frameworks into traditional KPI framework and contemporary KPI framework. Traditional KPI framework mainly comprises lagging indicators based on cost, time and quality, usually called iron triangle (Toor and Ogunlana, 2010). Further, lagging indicators provide information only on completed work items (Radujković, Vukomanović and Dunović, 2010). On the other hand, contemporary KPIs framework incorporates both lagging and leading indicators to enable firms to assess and benchmark their performance.

Jonsson and Rudberg (2017) suggest that the KPIs should be developed from identified competitive priorities. Watts and McNair-Connolly, (2012) and Mladenovic, Vajdic, Wündsch and Temeljotov-Salaj (2013) suggest that organizations should use KPIs based on their CSFs in order to monitor performance from different stakeholder perspectives. In the literature, the individual KPIs and CSFs are used sometimes interchangeably (see Ali et al., 2013). In some literature, individual KPIs and performance measures are used interchangeably. In this study, individual KPIs and CSFs (performance criteria) are used interchangeably.

KPIs have been widely applied in construction for performance evaluation (Deng and Smyth, 2013; Liu et al. 2015) and benchmarking (Constructing Excellence, 2018). In order to facilitate benchmarking, it would be important to establish a standard list of KPIs for the selected organizations (benchmarking club) or the particular industry. KPIs have also been used to some

extent for assessing supply chain performance (Ferreira et al., 2012; Ülgen and Forslund, 2015), service business performance (Sofiyabadi et al., 2016) and education performance (Amzat, 2017).

The KPI framework exhibits some strengths as follows. KPI framework plays a key role in providing information on the performance of tasks, projects, and an entire organization (Ali et al, 2013). KPI framework provides the basis for continuous improvement in organizational activities and processes (Sangwa and Sangwan, 2017, 2018). In doing, it can evaluate performance against the predefined targets to identify weak areas and to take appropriate actions for improvement (Sangwa and Sangwan, 2017, 2018). A well-established KPI framework can promote performance benchmarking among organizations and projects (Constructing Excellence, 2009; Haponava, and Al-Jibouri, 2012) and enhance and customer/client satisfaction (Constructing Excellence, 2018). Furthermore, Ramish and Aslam (2016) assert that KPIs can guide organizations to monitor growth against their strategy, discover areas of improvement and forms the basis for benchmarking against competitors or industry leaders. In summary, KPIs give organizations a simple and important CPMM framework for measuring, evaluating and benchmarking and improving their performance.

Meanwhile, some of the weakness of the set of KPIs include (1) it does not show a holistic view of the causal relationship between the different performance indicators (Oyewobi et al., 2015) and (2) it does not have a review procedure.

2.7.5 Results and Determinants Framework (RDF)

In studying PM in the service businesses, Fitzgerald et al (1991) proposed the Results and Determinants Framework (RDF), which is based upon three concepts of performance: dimensions, standards and reward. It is also known as the Building Block Model. Fitzgerald et al. (1991) suggest that this framework comprises six performance dimensions, which fall into two categories: results (outcomes) and determinants (drivers) of the results. The results reflect the success of the chosen strategy, while the determinants would determine the competitive success of an organization (Collier, 2013). This implies that the determinants will drive the results of an organization (Taticchi and Balachandran, 2008). According to Neely et al. (2000), the results

(lagging indicators) are the function of past business performance in relation to specific determinants (leading indicators). Table 2.7 shows the RDF framework with examples of performance measures across all six dimensions of performance.

Table 2.7 Results and Determinants Framework

Category	Dimension of performance	Type of measure
Results	Financial	Profitability; liquidity; capital structure; market ratios.
	Competitiveness	Relative market share; Sales growth; Measures of customer base.
Determinants	Quality	Reliability; responsiveness; courtesy; competence; availability.
	Resource utilization	Volume; delivery speed; specification.
	Flexibility	Productivity; efficiency.
	Innovation	Performance of the innovation process; performance of individual innovations.

Sources: Fitzgerald *et al.* (1991)

The Results and Determinants Framework (RDF) incorporates standards and a reward system to the dimensions (Fitzgerald et al., 1991) to facilitate performance improvement and growth. It is necessary that standards or targets are specific for the performance measures chosen from the dimensions of performance (Tangen, 2004). Consequently, business organizations could compare their performance against the specified standards or benchmarks as a basis of performance benchmarking. It should also be noted that the they could use industry averages to compare competitive performance. From the foregoing, the RDF framework could be used by business organizations for their competitive success. Meanwhile, the rewards are the motivators or incentives for the employees to work towards meeting the set performance standards and ultimately organizational objectives.

Although RDF is a well-known framework, it has been mainly applied in service industries. Accordingly, it has not been widely applied in the construction industry. However, some organizations have applied the determinants of performance from the RDR such as innovation to their PMM frameworks.

The literature has been reported some strengthens of RDF. For example, The RDF focuses both on external and internal organizational factors, and facilitates both feed forward and feedback controls within an organization (Taticchi and Balachandran, 2008). Another strength of the RDF

is that it measures reflects causality (Watts and McNair-Connolly, 2012). The RDF framework specifies the types of performance measures for each dimension and provides a useful development process (Hudson, Smart and Bourne, 2001). It also provides a close link between PMM, strategy and competitiveness of an organization (Garengo, Biazzo and Bititci, 2005).

One weakness of RDF is that the framework does not consider customers, employees and human resources as dimensions of performance and therefore represents an unbalanced view of performance (Hudson et al., 2001). Another weakness is that this framework specifies measures mainly for time-based competition, but it failed to incorporate other non-financial performance measures (Yadav-Sushil and Sagar, 2103). This Framework was developed mainly for business service organizations (Garengo et al., 2005) and may not be applicable to non-business organizations.

2.7.6 Summary of characteristics of selected PMM frameworks

In summary, the above contemporary performance measurement and management (CPMM) frameworks could generally be used for the achievement of organizational performance, in particular performance improvement. Common amongst the PMM frameworks are performance measures and CSFs (or KPIs). The CPMM frameworks could provide valuable information relating to multiple perspectives of an organization in order to give a more holistic view of its performance to all the relevant stakeholders. These CPMM frameworks are often applied within business organizations to support continuous improvement. In addition, they enable a more integrated approach of business process and activities. Table 2.8 below provides a summary of the key characteristics of CPMM frameworks discussed.

Table 2.8 Summary of key characteristics of CPMM frameworks

CPMM framework	Purpose	Brief description	Strength	Weakness
BSC	Enables organizations to evaluate their performance in alignment with strategy.	Holistic PMM tool Uses 4 perspectives, namely Financial, customer, internal business process and learning & growth perspectives; It is driven by both externally and internally-derived strategies.	It aligns performance measures to strategy as well as rewards; Encourages behaviours consistent with strategy.	It is a top down approach, which minimizes the interaction and dialogue between management and employees.
EFQM	Enables organizations to gain a holistic picture of their performance and demonstrate excellence.	Self-assessment tool; holistic PMM tool; Uses 9 performance criteria: namely Leadership, people, strategy, partnerships and resources, and processes, products and services as '*enablers*' criteria; and people results, customers results, society results and business results as '*results*' criteria.	It promotes QM and benchmarking among units within an organization or among organizations; It can assist organizations to generate information on SWOT; focuses on continuous improvement and performance excellence.	It does not allow prioritising of key areas for improvement; It does not provide instructions for problem identification and for it use.
MBNQA	To enable organizations to gain a holistic picture of their current level of performance excellence.	Self –assessment tool; PMM tool; Uses 7 performance criteria: leadership, strategy, customers; measurement, analysis and knowledge management; workforce; operations; and results.	Promotes QM, performance excellence and competitiveness improvement. Promotes benchmarking.	It is static and may not reflect the changes in the business environment.
Performance Prism	To help organizations to evaluate their business performance from 5 aspects of business.	Holistic PMM tool; Uses 5 facets of performance: Stakeholder satisfaction, processes, strategies, capabilities and stakeholder contribution; It is driven by both externally and internally-derived strategies.	Meets the needs of a wide group of stakeholders; It derives performance from multiple stakeholders; It allows an organization to question its strategy; Supports strategic alignment.	Shows little guidance for the selection of measures; Lacks a review procedure;

Table 2.8 Summary of characteristics of CPMM frameworks

CPMM framework	Purpose	Brief description	Strength	Weakness
KPIs	To evaluate performance from key impact areas of performance.	Uses set of measures to achieve organizational goals; Indicators are based on key performance drivers or value drivers.	It is simple CPMM framework; It promotes benchmarking among organizations in an industry; Focuses on key areas to achieve organizational success.	Does not give a holistic view of the relationship between different indicators; Lacks review procedures.
Results & Determinants	To evaluate the results and determine the competitive success of an organization.	PMM tool; Uses six performance dimensions, which fall into two categories: results (financial & competitive) and determinants of the results (quality, resource utilization, flexibility and innovation).	It capture both internal and external factors of an organization; It provides a close link between PMM, strategy and competitiveness	It does not consider other important dimensions of performance such as customers & employee; It may not be applicable to non-business service organizations.

2.8 Performance measurement and management (PMM) in construction

2.8.1 Overview of PMM in Construction

The forgoing discussions on the concepts, theories, systems/frameworks and practices of PMM are applicable to the construction industry. However, those that are more applicable to the construction industry are emphasized in this section. PMM in the context of construction is typically centred on three different levels, namely: project, organization (firm) and industry levels (Elyamany, Basha and Zayed, 2007; Chan, 2009; Deng, Smyth and Anvuur, 2012). Previous studies on PMM in construction have focused on evaluating project performance (Lin and Shen, 2007; Ali et al., 2013). In the last few decades, however, PMM in construction at the organization level has received growing attention in the literature (Ali et al., 2013; Jin et al., 2013). More specifically, there has been a plethora of construction related studies (e.g. Luu, Kim, Cao and Park, 2008; Jin et al., 2013; Oyewobi et al., 2015; among others) that examine the importance of PMM in construction, and the application of CPMM frameworks to construction organizations in order to measure, evaluate and manage their performance.

2.8.2 The need for PMM in construction

Traditionally, construction firms have been solely using traditional financial performance measures within their performance measurement (PM) systems/frameworks to assess their performance. The traditional PM systems/frameworks provided construction firms with information on budgeting, estimating and scheduling, costs and revenue, and variance analysis. However, the traditional PM systems/frameworks have been criticized for their backward looking and historical in nature; lack predictive ability to explain future performance trend; and providing information only on root causes (Bourne et al., 2000; Kaplan and Norton, 2001; Gomes et al., 2004, cited by Oyewobi et al., 2015, p.111). Furthermore, traditional PM frameworks have been considered inadequate for strategic decision-making (Oyewobi et al., 2015) and to compete in the competitive and dynamic construction environment.

There has been a shift by construction firms from using solely financial performance measures to using a combination of both financial and non-financial performance measures within PMM frameworks such as the BSC and EFQM frameworks to assess their performance. These CPMM systems/frameworks aimed at addressing the limitations of PM frameworks and reflecting the complexity and dynamic construction environment. However, the shift in emphasis to CPMM frameworks has been slow to the construction industry (Deng and Smyth, 2014).

Over the years, construction firms have adopted well-known CPMM frameworks such as the BSC and EFQM frameworks to assess their performance. Typically, these CPMM frameworks should be tailored to match the requirements and circumstances of individual construction firms and ultimately the construction industry (Jin et al., 2013). Deng and Smyth (2013) argue that these CPMM frameworks reflect the advanced practices (i.e. practices that go beyond the traditional ones) of organizational PMM in construction. However, it is necessary to identify and address the key obstacles impeding the successful implementation of CPMM frameworks within construction firms.

Hu and Liu (2016) emphasize the need for CPMM to drive performance in, and support the development of construction. Moreover, there is growing recognition of the need for construction firms to adopt CPMM systems/frameworks to provide relevant information for accomplishing their

strategies and objectives. By adopting CPMM, it hope that that construction firms can achieve continuous improvement (Meng and Minogue, 2011; Halman and Voordijk, 2012), including project management improvement (Haponava and Al-Jibouri, 2012) and improvement in their competitiveness (Oyewobi et al., 2015). According to Yu et al. (2007), construction firms can adopt CPMM frameworks for evaluating management performance, managing human resources, and formulating corporate strategy (p.131).

Effective CPMM frameworks enable construction firms to develop strategies that would improve their competitiveness, support their decision making process, benchmarking their performance (Ali et al., 2013; Ercan and Koksal, 2016); achieve profitability and sustainable growth (Horta, Camanho, Johnes and Johnes, 2013; Hu and Liu, 2016); and capture and integrate the interests of all their key stakeholders (Cheng et al., 2014). Furthermore, CPMM frameworks can improve the budgeting process for construction projects and firms (de Azevedo, Lacerda, Ensslin, Jungles and Ensslin, 2013), and can support and improve collaborative design in construction (Ren, Anumba, and Yang, 2013). In addition to identifying performance gaps and key areas for improvement, CPMM frameworks enable construction firms to support organizational learning (Oyewobi et al., 2015).

2.8.3 PMM frameworks in construction

There are three main CPMM frameworks that have been proposed, adapted and applied in construction to measure project, organizational and industrial performance. They include are the balanced scorecard (BSC) model, key performance indicators (KPIs) model, and European Foundation for Quality Management (EFQM) excellence model (Yang, Yeung, Chan, Chiang and Chan, 2010; Meng and Minogue, 2011; Vukomanovic, Radujkovic and Nahod, 2014; Oyewobi et al., 2015). In addition, the Malcolm Baldrige National Quality Award (MBNQA), which is business excellence model, has been widely applied in construction in the USA and many other countries to evaluate organizational performance (Oyewobi et al., 2015). Some of well-known CPMM frameworks, which have been applied in construction are discussed at the three mains levels of construction performance.

3.8.3.1 Organizational performance level

Organizational performance is an indicator that measures how well an organization achieves its goals and objectives (Ho, 2008, p.1238). Therefore, improvements in organizational performance can be achieved when an organization effectively implements strategies to achieve its goals and objectives. PM diversity and goal attainment from multiple perspectives are necessary for improvement in quality and organizational performance. Construction firms should ensure that they achieve improvement in organizational performance. CPMM frameworks such as the BSC (e.g. Jin et al., 2013; Ng and Skitmore, 2014), EFQM (Vukomanovic et al., 2014) and benchmarking (Nasir et al., 2012; Kärnä and Junnonen, 2016) frameworks have been adopted by construction firms to assess and improve their performance. Yu et al. (2007) proposed the adoption of the original BSC to evaluate the performance of construction firms, while Ozorhon, Arditi, Dikmen and Birgonul (2011), Halman and Voordijk (2012) and Jin et al. (2013) proposed the application of a modified BSC for performance evaluation of construction firms. An EFQM based model was proposed by Mohamed and Chinda (2011), and Shanmugapriya and Subramanian (2016) to evaluate the safety practices and safety performance improvement in construction firms.

Construction firms have applied several well-established quality management (QM) frameworks/models to evaluate their performance, achieve continuous improvement in quality and competitive advantage. For example, Lam, Lam and Wang (2008) proposed a MBNQA-oriented self-assessment quality management system (SQMS) that is based on the seven criteria of Malcolm Baldrige National Quality Award (MBNQA) for construction contractors. The proposed framework can be used to assess continuous improvement in their quality performance, and for benchmarking (Lam et al., 2008). Other QM models proposed and implemented within construction firms include TQM Model (e.g. Altayeb and Alhasanat, 2014; Willar, Coffey and Trigunarsyah, 2015), Six sigma (Han, Chae, Im and Ryu, 2008; Tchidi, He and Li, 2012; Taner, 2013; Ullah, Thaheem, Siddiqui and Khurshid, 2017), and Lean construction (e.g. Al-Aomar, 2012; Ayarkwaet al., 2012; Tezel and Nielsen, 2013; AlSehaimi et al., 2014; Ogunbiyi, Goulding and Oladapo, 2014; Khaba and Bhar, 2017).

Furthermore, Chan and Chan (2012) propose the use of performance measurement index (PMI) by construction senior executives and project managers to measure, monitor, evaluate and upgrade

the project performance level. In a recent study, Liu et al. (2015) considered the application of the Performance Prism for performance evaluation in construction**.** Table 2.9 presents PMM frameworks used to evaluate and compare the performance of construction organizations.

Table 2.9 PMM systems/framework used in construction organizations

Author (s)	**PMM framework**	**Purpose**	**Description**
Organizational level			
Yu et al. (2007)	Original BSC	To measure and compare the performance of construction firms.	The framework comprises the 4 original BSC perspectives, and focuses on providing performance benchmarks and the validation of causal relationships among KPIs.
El-Mashaleh, Minchin, and O'Brien (2007)	Benchmarking model	To measure construction firm performance on a company-wide.	Model uses industry-relevant metrics to measure the overall efficiency of construction firms using five performance dimensions: schedule; cost; safety; customer and profit.
Luu et al. (2008)	Original BSC	To identify and validate KPIs to measure strategic performance of large contractors.	The framework includes the 4 original BSC perspectives and identifies useful SWOT factors for strategic PMM.
Horta et al. (2010)	Integrating PKIs	To establish KPIs for assessing organizational and operations performance.	Develop a methodology for assessing company overall performance.
Ozorhon at el. (2011)	Modified BSC	To measure the performance of international joint venture (IJV).	The framework comprises 4 perspectives: project performance, partner performance, performance of IJV management, and perceived satisfaction with IJV.
Halman and Voordijk (2012)	Modified BSC	Develop a framework to measure performance of supply chains of house-building firms.	The framework comprises the 4 original BSC perspectives plus external process perspective.
Jin et al. (2013)	Modified BSC	To measure international construction firms' performance.	Develop a framework that comprises the 4 original BSC perspectives plus market and stakeholder perspective.
Vukomanovic et al. (2014)	EFQM	Analyze and validate the use of EFQM and attempt to improve methodological rigor in analyzing quality in the construction industry.	The framework comprises the 9 EFQM perspectives.
Ng and Skitmore (2014)	BSC	To evaluate the performance of subcontractors.	Develop a balanced scorecard model for appraising the performance of subcontractors.
Kärnä and Junnonen (2016)	Benchmarking (BM) Framework	To evaluate the performance of different discipline groups on project, firm and industry levels.	The BM framework categories include project management, staff, collaboration and project goal accomplishment.

3.8.3.2 Project performance level

Project performance is the realization of predefined project objectives (Ozorhon et al., 2011) and hence project success. It is important to assess the performance of projects that are fully complete or in progress (Cha and Kim, 2011). Effective management of performance in a construction project enables the delivery of satisfactory products to the client (Idrus, Sodangi and Husin, 2011). Ling, Low, Wang and Lim (2009) found that superior project performance could be achieved when emphasis is given to scope management since it is an upstream activity that affects other downstream activities and project output. According to Hwang, Tan and Sathish (2013), project performance information could enable a construction firm to conduct internal and external benchmarking to gain an objective judgement of project success level in the context of the industry. However, Cha and Kim (2011) argue that it is can be difficult for a construction firm to benchmark its project performance against achievement of other firms since construction industry deals with individual projects, which are unique.

Managers of construction firms have been applying numerous CPMM frameworks to evaluate and compare the performance of their construction projects to know whether they have achieve objectives. The CPMM frameworks should be relevant to the goals and characteristics of the projects. Examples of CPMM systems/frameworks that have been applied in construction projects are shown in table 2.10.

It is observed that the industry based Key Performance Indicators (KPIs) framework is one of the the most widely used framework for performance evaluation and comparison of construction projects (Haponava and Al-Jibouri 2012; Yuan, Wang, Skibniewski and Li, 2012; Ali et al., 2013). Traditionally, the performance indicators at the project level mainly focus on time, cost, and quality, known as iron triangle (Toor and Ogunlana, 2010). It is important to move beyond the traditional "iron triangle" of time, cost, and quality (TCQ) using the KPIs, to a more contemporary KPIs approach comprising both lagging (quantitative) and leading (qualitative) indications (Toor and Ogunlana, 2010; Yeung, Chan, Chan, Chiang and Yang, 2013: Liu et al., 2016). Some examples of qualitative KPIs include environmental regulations, building performance, client satisfaction (Toor and Ogunlana, 2010) and reputation (Al-Tmeemy et al., 2011).

Table 2.10 PMM systems/frameworks in construction projects

Author (s)	PMM framework	Purpose	Description
Project level			
Haponava and Al-Jibouri (2009)	KPIs	To evaluate construction project performance.	The framework incorporates process-based KPIs relevant for control of the pre-project stage.
Hwang et al. (2010)	Metrics framework	To evaluate and compare the performance of pharmaceutical facility construction projects.	The framework uses performance metrics for measuring and comparing pharmaceutical construction project performance.
Haponava and Al-Jibouri (2010)	KPIs	To evaluate construction project process performance.	The framework includes Time, cost/financial, quality, safety, value and objective, stakeholders' requirements, and communication KPIs.
Toor & Ogunlana (2010)	KPIs	To evaluate the performance of construction projects.	The framework uses both tradition quantitative and qualitative KPIs in the context of construction projects in Thailand.
Al-Tmeemy, Abdul-Rahman and Harun (2011).	Success criteria model	To assess the project performance.	The framework incorporates success criteria for building projects in Malaysia from the contractors' perspective: project management success, product success and market success.
Cha and Kim (2011)	Quantitative performance measurement system	To evaluate the performance of residential building projects.	The framework incorporates 18 KPIs to evaluate various aspects of the performance of residential building projects.
Yuan et al. (2012)	KPIs	To evaluate the performance of PPP projects.	The framework identify 41 KPIs under five packages.
Kang et al. (2013)	Benchmarking	To evaluate and improve project performance.	Cost/financial, schedule (time), and rework cost.
Yeung et al. (2013)	Benchmarking model	To assess project success in Hong Kong.	The model incorporate both leading and lagging KPIs such as (1) safety performance, (2) cost performance, (3) time performance, (4) quality performance, (5) client's satisfaction, etc.
Nassar and AbouRizk (2014)	Integrated project-performance index framework	To assess project performance during the construction phase.	The framework provides a systematic and structured approach to evaluate project performance from the contractor's perspective.
Liu et al. (2015)	Performance Prism	To evaluate the performance of PPP infrastructure projects.	The conceptual framework can be used to design and select effective performance measures for PPP projects.
Jonsson and Rudberg (2017)	KPIs	To evaluate the performance for residential building project.	The framework uses KPIs for residential building performance from the production strategy perspective.

3.8.3.3 Industry performance level

According to some authors (Horta et al., 2013; Willar, 2017), the performance of construction firms cumulatively will give rise to the performance of the construction industry (Willar, 2017). Traditionally, the performance of the construction industry was evaluated using productivity and the percentage contribution of construction Gross Domestic Product (GDP) to national GDP. As result of the dynamic changes in the construction environment, the construction industry needs to adopt PMM frameworks that are suited to its project-based, multidisciplinary and multi stakeholder structure (Kärnä and Junnonen, 2016). Accordingly, the same CPMM frameworks that are applicable at the construction project and firm levels can also be used to evaluate the performance of the construction industry. In the same vein, Chan (2009, p.1233) suggests that the performance measures for the project performance level are sub-sets of the measures for the firm performance level, and the aggregation of firm measures evolve into measures for the construction industry. Very few studies (e.g. Chan, 2009) have investigated empirically the use of CPMM frameworks to evaluate the construction industry.

For example, Chan (2009) adopts the BSC framework, which incorporates the original four perspectives to measure and evaluate the performance of the construction industry. This author identifies key performance measures for the construction industry including inter alia annual construction demand, productivity growth rate, construction R&D expenditure, labour productivity, number of accidents, training days provided per year. Kärnä and Junnonen (2016) proposed a benchmarking framework to evaluate the performance of all three levels, namely project, company and industry levels. Furthermore, productivity has been considered as an important measure that is widely used to evaluate the construction industry performance (Vogl and Abdel-Wahab, 2014). Jin et al. (2013) suggest that the construction industry is client-driven, and therefore satisfying the requirements of clients should be critical to the success of both construction projects and organizations. This applies that it is pivotal to develop and execute customer satisfaction measures for the all three level of construction performance.

2.8.4 Innovation and PMM in construction

Today's dynamic business environment demands that organizations should make the use of innovation to realize success and effective organizational change. Aouad, Ozorhon and Abbot

2010, p.375) refer to innovation as "the creation and adoption of new knowledge to improve the value of products, processes, and services". This definition implies that the primary outcome of innovation is value improvement. It has been recognized that innovation has provided many business organizations and countries throughout the world with strategic opportunities to meet their needs. For example, innovation continues to contribute significantly to a country's economic growth and competitiveness (Aouad et al., 2010) and sustainable development. Business organizations have exploited innovation to effectively meet the needs and demands of their clients and support improvement in organizational performance. Furthermore, many business organizations are making use of innovation to gain competitive advantage and to adapt on a continuous basis to changes in the business environment.

The literature has proffered several different categories for innovation. Serpell and Alvarez (2014) categorize innovation into two types, namely process innovations and product innovations. According to Akintoye, Goulding and Zawdie (2012, p.46), product innovation entails the development and introduction of new or improved products and/or services, which create or meet a new demand, and which are successful in the market. Whereas process innovation is concerned with the adoption of new or improved methods of manufacture, distribution or delivery of service that lower the true or real cost of producing outputs (Akintoye et al., 2012, p.46). Meanwhile, Ozorhon (2013) suggests that there are three types of innovation in construction, namely process innovations, product innovation and organizational innovation. Akintoye et al. (2012) suggest that organizational innovation is oriented towards effectively managing the firm as well as the implementation of new organizational strategies. Generally, innovation is a central element for improving effectiveness and competitiveness. In this study, construction innovation can be referred as the successful development and/or implementation of new ideas, knowledge, products, processes or practices, in order to enhance organizational effectiveness and competitiveness. Therefore, construction managers must translate the innovative ideas or knowledge into organizational reality, even in complex circumstances.

It has been widely acknowledged that innovation in the construction industry is co-creation of knowledge and value in a multi-stakeholder environment and shaped by the requirements of the project (Ozorhon, 2013). Compared to other industries such as manufacturing, the construction

industry has been slow in the adoption of innovation (Ozorhon, Abbott and Aouad, 2009; Serpell and Alvarez, 2014). Ozorhon et al. (2009) suggest that since the construction industry is largely project based and fragmented, then the majority of innovation happening at a project level.

Blayse and Manley (2004, p.144) identify six main factors (enablers or barriers) that influence innovation in the construction industry, namely, (1) clients and manufacturers, (2) the structure of production, (3) relationships between individuals and firms within the industry, (4) between the industry and external parties, (5) procurement systems, regulations/standards, and (6) the nature and quality of organizational resources. This means that construction firms should use innovation as enablers of development, value creation, performance improvement and that would successfully achieve other organizational objectives. Serpell and Alvarez (2014) identify six drivers of innovation in the construction industry as follow:

1. Culture and human capital deals with attitude to change, perception about management commitment to innovation, training and support to workers;
2. Organization structure focuses on the way in which decisions are made within the organization and the level of autonomy of decision-making;
3. Technology focuses on the application of technology in the construction processes and methods, including kind of technology used and the frequency of its application in the processes.
4. Research and development (R&D) addresses the ways and reasons firms realize innovation and development;
5. Partnering is concerned with the alliances of a firm with other organizations for innovation and development purposes;
6. Knowledge management focuses on building the capacity to manage both internal and external knowledge; and

These key drivers of construction innovation would enable construction organizations to generate and apply new ideas, new competencies and new procedures and methods to improve their effectiveness and competitiveness. The priority given to these key drivers of construction innovation varies among construction firms based on their purpose, strategy and context, although prominence seems to be given to technology. As suggested by Bigliardi and Dormio (2010),

construction firms that are searching for high performance or excellence should continuously invest in technological innovation and people (Bigliardi and Dormio, 2010). Meanwhile, a number of authors (e.g. Kulatunga, Amaratunga and Haigh, 2007) have highlighted the importance of R&D as a driver of innovation in the construction industry in term of enhancing the effectiveness and competitiveness of construction organizations. However, R&D investment in construction as well as the applicability of innovation results in construction are low (Kulatunga, Amaratunga and Haigh, 2007).

Although innovation adoption and diffusion in construction is low, a significant amount of innovation has occurred in the construction industry (Loosemore, 2015). Building information modelling (BIM), drones, augmented reality/virtual reality (AR/VR), automation, Lidar, smartphones and tablets (CITB, 2018) and geographic information system (GIS) are some innovations that are being adopted across the construction industry to address its challenges. For example, BIM as an innovative approach could improve and transform the entire construction industry. In construction, BIM has provided better coordination and integration of construction processes and systems, cost estimating and monitoring and resource management, and improvement visualization management and logistics management.

A drone technology or Unmanned Aerial Vehicle (UAV) is a recent recognizable innovative approach that has been applied widely in the construction industry. The outcomes and the benefits generated by drone applications in the construction industry include among others the following: increased efficiency lower costs, increased worker safety, and benefits of aerial photography (Blocker, 2016). The Contractor (2018) suggest that drones can be used in five ways in the construction industry, viz.

1. safety and security – they have the capability to track resources on construction site and identify potential safety issues;
2. Photogrammetric mapping – they have the capability to obtain a comprehensive survey of land, buildings and infrastructure;
3. Inspection and monitoring – they have the capability to detect precarious conditions, materials, and for assessing structures aerially such as investigation of a roof for damage;

- real-time updates – it has the capability to provide real-time information on events going on around a construction site; and

4. Marketing – it competitive advantage.

The literature has established that there has been growing importance of innovation to the construction industry and consequently, construction firms would need to measure and manage their innovative activities and performance. A CPMM framework can be used to measure and manage construction innovation. Construction firms can develop performance measures for innovation and cluster them as innovation perspective for inclusion in their CPMM frameworks. Ozorhon et al. (2009) suggest performance measures for construction innovation should be developed at project-level, firm level and industry sector level. Construction firms need to set targets for their key innovation performance measures to determine their innovation performance gap as well as develop and implement innovation initiatives in order to maintain or enhance their position in the market. The innovation perspective will ensure that constructions firms can be beneficiaries of value creation through improvement in internal business process, products and services. Furthermore, the innovation perspective should focus on the long-term goals and objectives of construction firms. The performance measures in this perspective can be related to six drivers of construction innovation articulated by Serpell and Alvarez (2014) such as technology, and human capital, knowledge management, and R&D.

As evident from literature, the innovation performance measures are included in an innovation perspective or within a learning and growth perspective, and/or internal business process perspective. It should be noted since in the early 1990s, some of the CPMM frameworks such as Results and Determinants framework by Fitzgerald et al. (1991) included innovation as a performance perspective or dimension. More recently, in a modified BSC proposed for construction firms, Jin et al. (2013) show the innovation performance measures such as application of IT, efficiency of R&D input and output within the learning and growth perspective, whilst coordination and integration of business efficiency the supply chain are included within the internal business process perspective. Furthermore, Yu et al. (2007) proposed a BSC for construction firms, where R&D and technological capability are incorporated within the internal business process perspective, while informatization and HR development are included within the

learning and growth perspective as innovative performance measures. Similarly, R&D expenditure was an important innovative performance measure within the internal business process perspective of the BSC proposed by Chan (2009). In similar vein, construction firms should select innovative performance measures that are aligned with their strategic architecture (e.g. mission, values, strategy and structure) to achieve success in innovation.

2.8.5 PMM in the construction in Saint Lucia

PMM has been of growing concern in construction in Saint Lucia, given the importance of the construction sector to the economy. The sector generates employment (Government of St. Lucia, GOSL, 2017), provides the infrastructure and buildings on which all other sectors of the economy depend, and acts as a stimulus to spur economic recovery and growth. Moreover, the construction sector as a whole has been one of the important economic indicators of the economy of Saint Lucia, accounting for approximately 5.6 percent of GDP (GOSL, 2017; 2018).

There is evidence to suggest that the construction industry in Saint Lucia has been measuring performance for a long time. A key measure that is used in the construction industry in Saint Lucia is 'dealing with construction permits indicators' which includes the time and cost to complete procedures (The World Bank, 2016). This measure is used for benchmarking in the Saint Lucian construction industry against other economies in the world. In relation to the ease of dealing with construction permits, Saint Lucia currently stands at 50 in ranking of the 189 economies assesses. (The World Bank, 2016, p.25). Revenue, cost, profitability, and production efficiency are among the key performance used by construction firms in Saint. Lucia to evaluate their performance (Enterprise Surveys, 2013). NCPC in Saint Lucia is promoting the use of productivity measurements and benchmarking within all industries include construction in order to improve their competitiveness and growth (NCPC, 2015). This suggests that emphasis has been placed on efficiency and financial (lagging) measures, which are inadequate to capture the competences and performance of the construction firms in this dynamic business environment, and therefore, equally emphasis should be placed on non-financial measures.

The Saint Lucian construction industry over the years has been characterised by high inefficiencies, low levels of productivity, high costs and opportunistic behaviour (GOSL, 2017).

This may be due to use of traditional PM frameworks and the structural characteristics of the construction industry such as its fragmentation and project-based approach. In recognition of these performance issues, the Government of Saint Lucia (GOSL) has undertaken some initiatives over the years. For example, the Government of Saint Lucia (GOSL) has established a National Competitiveness and Productivity Council (NCPC) in 2013 to promote productivity, benchmarking, competitiveness and improve overall performance at both the national, sectorial and organizational levels in construction as well as other key economic sectors (NCPC, 2015). The Saint Lucian Bureau of Standards was established 1990 to develop and maintain national standards and certification programmes for organizations to adopt in order to improve the quality of their products/services and overall performance (Saint Lucian Bureau of Standards, SLBS, 2018). However, the SLBS has placed more emphasis on developing standards for the manufacturing sector.

Furthermore, the public has been demanding better performance measurement and improvement within Saint Lucian construction industry. This has occasionally prompted that Government of Saint Lucia to commission reviews and audits within the industry (e.g., GOSL 2017), and therefore use the findings and recommendations from these specific reviews to better measure and improve the industry performance. For example, a recent audit report cited poor cost and time predictability of construction, cost and time overruns, poor quality, low productivity and low client satisfaction as serious areas of concern (GOSL, 2017). Furthermore, the audit report recommended that particular emphasis should be placed on applying an effective performance measurement and improvement system within construction firms to monitoring performance standards, and achieve stakeholder accountability and improvement in the construction sector (GOSL, 2017). Today, very little progress has been made in the implementation of the recommendations from the various reports. Accordingly, these improvement initiatives have not really had a positive impact on the construction industry in Saint Lucia in terms of improvement in its measurement and management.

Furthermore, the changes in the business environment has prompted Saint Lucian construction firms to look for better organizational practices to improve their performance. In addition to the economic and political uncertainty, Sonson and Kulatunga (2014) found that internal organizational factors are significantly influencing the performance of construction firms in Saint

Lucia in effectively meeting their clients' needs. Innovative management systems such as CPMM frameworks are important internal organizational factors that Saint Lucian construction firms can use to meet their clients' needs and improve their performance. ICT application and organizational culture is also an important internal organizational factor that can influence their performance.

Moreover, the construction and valuation professions in Saint Lucia are increasingly facing challenges and scrutiny in the industry. The challenges include among others the cyclical nature of construction and property market, inadequate access to reliable market information and cost analysis information, the underestimation of risk levels associated with properties in the market, inaccurate estimation of the value of individual real estate properties, the high transaction costs, ignoring externalities and lack of using innovative management approaches. These challenges have triggered a credit and other financial regulatory tightening. This has caused many construction clients to focus on the upfront costs of design and construction, rather than on the quality and value creation of the resultant assets over their economic lives and a decline in organizational competitiveness within the industry. Furthermore, the foreign owned banks have outsourced their property valuation process to an international valuation firm in order to improve their decision-making process and overall performance.

In order to address some of these challenges, Saint Lucian construction firms could develop and use CPMM frameworks, which are integrated with other management system and supported by ICT, that generate relevant information to enable managers to make timely and appropriate decisions. Further, greater involvement of government and other key industry players in the creation of a centralized property information system that can provide information on all market transactions as well as building cost information.

The literature review has revealed that there is no known study providing empirical evidence on the development (design, implementation and use) of PMM frameworks within the construction industry in Saint Lucia. Further, there is a lack of compelling evidence from research or otherwise to show that PMM frameworks can improve performance of firms in the construction industry. Accordingly, this study will explore the PMM practices within construction firms in Saint Lucia,

and develop a new PMM framework that enables them to better measure and manage their performance.

2.9 Chapter summary

This chapter has provided a comprehensive review of the literature on PMM in general, PMM in construction and PMM in construction in Saint Lucia. Firstly, the chapter provides the definition of important concepts such as performance measurement, performance management, performance measurement system, and performance measure. It highlighted some key PMM developments as well as the key characteristics of CPMM systems/frameworks including performance perspectives, CSFs, performance measures and the casual relationship. The chapter also articulated the need for CPMM in business organizations and in particular in construction to meet their business objectives. Performance improvement, decision-making, and evaluating people's behaviour are some of the uses of CPMM systems/frameworks.

This chapter discusses the lifecycle of a typically CPMM system/framework, highlighting the phases of design, implementation, use and review. Developing performance measures and identifying key business objectives are some key aspects of the design stage of CPMM system, while the implementation phase of the CPMM system/framework involves system implementation to collect and analyzse data, and disseminate information. The use of the CPMM system/framework phase involves using the measures to achieve key organizational objectives. Further, this chapter presents the potential barriers to a CPMM implementation as well as strategies to overcome the barriers.

The Chapter also provided a distinction between CPMM system and CPMM framework. CPMM system comprises both structural and procedural frameworks as well as other tools such as ICT infrastructure, etc., whereas the CPMM framework comprises a set of performance measures, key performance dimensions or perspectives and the relationship between the measures and perspectives (Folan and Browne, 2005). It went on to discuss several well-known CPMM frameworks have been deployed within business organizations and industries to measure and manage performance. The next chapter presents the research methodology of this study.

Chapter 3 Research Methodology

3.1 Introduction

This chapter discusses the entire research methodology and presents the justification of the appropriate elements (e.g. philosophy) of the research methodology and the choices within the elements adopted in this study. This chapter also discusses the trustworthiness of research in terms of validity and reliability of the research instruments and data, and the ethical considerations relevant to the study.

Research methodology provides the overall approach to the entire process of the research and encompasses a body of methods (Collis and Hussey, 2014, p.10). Very importantly, it encapsulates various constituent elements in the research where a researcher has to made decision choices about the alternatives within each element such philosophy, approach, etc. It is important to note that a decision to select an alternative in a research element flows logically from and is influence by the one(s) preceding it, and influences the choice at the next element. A set of research elements adopted by a researcher forms the methodology framework for conducting the research to address the research problem. Gill and Johnson (2010) suggest that a research methodology is a compromise between choices or options to be made in relation to philosophical assumptions, and the choices are usually influenced by practical issues such as the availability of resources and the ability to gain access to organizations and its membership in order to conduct the research (p.6). Therefore, it is particular important that researchers understand the philosophical assumptions and commitment that they make via methodological choices.

3.2 Research Methodology frameworks

The literature identifies two well-known research methodology frameworks for conducting a research: the Nested Research Methodology framework introduced by Kagioglou et al. (1998) and the Research Onion model introduced by Saunders, Lewis and Thornhill (2016). Firstly, the Nested Research Methodology presented by Kagioglou et al (1998, 2000) can be characterized as a hierarchical framework to undertake the research. According these authors, the Nested Research Model comprises three hierarchical layers or rings as follows: (1) The research philosophy is the outer ring which guides and stimulates the inner rings of research approaches and research

techniques; (2) The research approaches comprise the dominant theory generation and testing methods; and (3) Research techniques comprise the date collection tools such as questionnaire, interviews, and literature review.

Figure 3.1 Nested Research methodology framework (Kagioglou et al., 2000).

Saunders et al. (2016) articulate the research onion framework, which comprises six layers starting with philosophies as the outer layer and moving progressively inwards up to the techniques and procedures layer in the centre of research onion. The six layers are placed in the following hierarchical order: (1) philosophy, (2) approach to theory development, (3) methodological choice, (4) strategy(ies), (5) time horizons and (6) techniques and procedures. The research onion framework is depicted in figure 3.2.

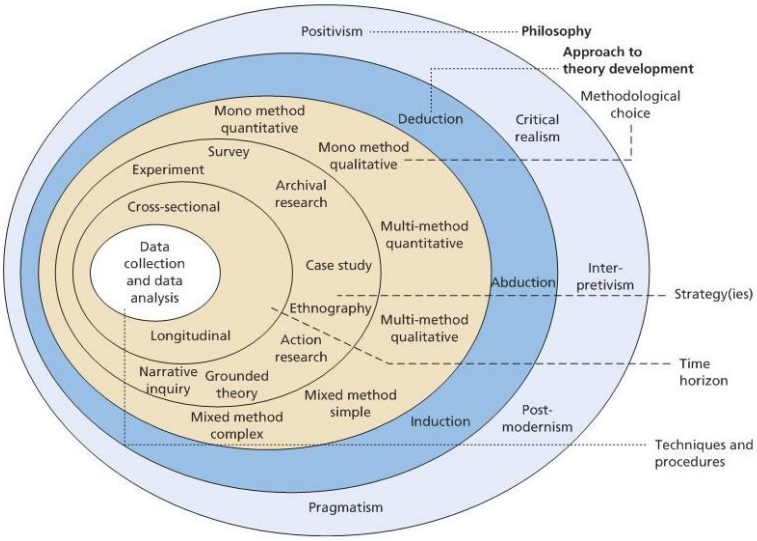


Figure 3.2 Research Onion (Saunders et al., 2016).

The Comparison between the Nested Research methodology framework and Research Onion is shown in table 3.1.

Table 3.1Comparison between the Nested Research Model and Research Onion Model

Attribute	Nested Research model	Research Onion Model
Structure	Hierarchical (Kagioglou et al., 2000)	Hierarchical (Saunders et al., 2016).
Research element or stage	Three research elements (Kagioglou et al., 2000)	Six research elements (Saunders et al., 2016).
Coverage	Narrower	Broader

It can be observed that the research onion framework provides a broader and holistic perspective of research methodology compared to the Nested Research methodology framework by Kagioglou et al. (1998, 2000). Accordingly, this study adopts the research onion framework in order to use appropriate research elements within research methodology to systematically address the research problem and questions, and ultimately achieve the research aim and objectives. Each layer in the research onion is discussed and the justification for adopting the appropriate choice(s) or alternative(s) within each layer is provided below.

3.3 Research philosophy

The outer layer of the research onion is the research philosophy. According to Saunders et al. (2016, p.124) "research philosophy refers to a system of beliefs and assumptions about the development of knowledge". The assumptions therefore underpin the entire research process (Saunders et al., 2016). Easterby-Smith, Thorpe, and Jackson (2018, p.60) suggest that researchers need to have an understanding of the research philosophy for the following four main reasons: (1) To have a clear sense of their reflective role in the research, (2) To clarify research designs, (3) To recognize which design will work and which will not; and (4) To help researchers to identify, create and operate designs that may be outside their past experience. Thus, it is important to properly evaluate the philosophical assumptions, as they form the linchpin of the research.

3.2.1 Types of philosophical assumptions

It imperative to note that the assumptions and views infused in the philosophy influence how research should be conducted to meet its aim and objectives (Bryman 2016). Saunders et al. (2016)

identify ontology, epistemology, and axiology as the three main assumptions embodying the research philosophy. These three concepts are further explained below.

3.2.1.1 Ontology

Ontology is concerned with the claims and assumptions researchers make about the nature of the world and reality (Creswell, 2014; Collis and Hussey, 2014; Saunders et al., 2016). According to Gill and Johnson (2010, p.241), ontology is referred to as "the study of the essence of phenomena and the nature of their existence". Gray (2014) suggests similar view. This implies that people have to determine and make sense of reality, and each person may have a different interpretation of a particular reality. Moreover, Yin (2014) suggests that ontology deals with the philosophical underpinnings of a person's conceptualisations about whether reality (or realities) is singular (or multiple). Three key ontological questions to be answered in any research are (1) whether or not social reality exists independently of human conceptions and interpretations; (2) whether there is a common, shared, social reality or just multiple context-specific realities; and (3) whether or not social behaviour is governed by 'laws' that can be seen as generalizable (Snape and Spencer, 2003, p.11). It is important that researchers adopt an ontological position that is appropriate to the research questions and objectives.

3.2.1.2 Epistemology

Epistemology is concerned with the assumptions about acceptable knowledge in a discipline (Bryman, 2016; Saunders et al., 2016). Along the same vein, Yin (2014) emphasizes that epistemology refers to a person's epistemological position relating to the nature of knowledge and how it is derived or created for a particular reality. The nature of knowledge about phenomenon can be based on fact or opinion (Saunders et al., 2016). Furthermore, researchers can gather knowledge about a phenomenon from scientific research methods, or natural location or setting or a combination of both. Gray (2014) suggests that epistemology provides the philosophical reasoning for deciding what kinds of knowledge are legitimate and adequate from a phenomenon. It important to gain an understanding of the relationship between the researcher and the researched (subject) from an epistemological point of view.

3.2.1.3 Axiology

Axiology is concerned with "the role values and ethics within the research process" (Saunders et al., 2016, p. 128). In other words, axiological position recognizes where the researchers are located throughout the research in terms of their value judgement and ethical behavior. The literature classifies value in research into value-free and value-laden (value-bounded) (Saunders et al., 2016). A value-free research is influenced by objective criteria and detachment rather than by researcher's own beliefs, feelings, interests, skills, and experience in order to discover the reality (Saunders et al., 2016). Meanwhile, value-laden research is driven by the researcher's as well as participants) own interests, beliefs, skills, and experiences about reality (Saunders et al., 2016). In value-free research, the researchers are engaged in reflexivity, i.e. they reflect on their own biases, values, and assumptions and actively write them into their research (Creswell, 2012).

3.2.2 Objectivism and subjectivism

Objectivism and subjectivism are alternative theoretical perspectives, which hold contrasting or opposing extremes about the social world. According to Saunders et al. (2016), objectivism adopts the assumptions of natural sciences, whereas subjectivism adopts the assumptions of arts and humanities. Generally, objectivist researchers try to maintain an objective and independent stance in the study (Easterby-Smith et al., 2015). In contrast, Saunders et al. (2016, p.130) assert that subjectivism is a "social reality made from the perceptions and consequent actions of social actors (people)." Furthermore, Saunders et al. (2016) place three types of philosophical stances, namely epistemology, ontology and axiology along the objectivism and subjectivism continua. The philosophical assumptions along the objectivism-subjectivism continua are depicted in Table 3.2.

Table 3.2 Philosophical assumptions along the objectivism –subjectivism continua

Assumption type	Objectivism	Subjectivism
Ontology	Reality is real; Reality is being external One true reality; The world is made up of granular things; The world represents Order	Nominal/conventional; Reality is being social constructed; Multiple realties; Flowing; It represents chaos
Epistemology	Facts; Numbers; Observable phenomena; Law-like generalizations	Opinions; Narratives; Attributed meanings; Individuals and contexts, specific.
Axiology	Value-free- Detachment from own values throughout the research	Value-bound- Researcher is integral and reflexive in the research

Source: Saunders et al. (2016, p.129)

3.2.3 Types of research philosophies

Saunders et al. (2016) suggest that there are five main types of research philosophies as follows: positivism, interpretivism, pragmatism, critical realism, and postmodernism. Typically, positivism and interpretivism can represent the extreme ends of the philosophical continuum (Collis and Hussey, 2014; Bryman, 2016). Table 3.3 presents the key features of Positivism and Interpretivism. The other philosophies are usually situated between these two extremes. Table 3.4 shows the comparison of the five research philosophies and their philosophical assumptions. The philosophy types are discussed in the following sections.

3.2.3.1 Positivism and interpretation

Positivism is a traditional philosophy (see tables 3.3; 3.4), which involves the application of physical and natural scientific methods to the study of reality (Easterby-Smith et al., 2015; Bryman, 2016; Robson and McCartan, 2016). Denscombe (2010) suggests that positivism emphasizes objectivity, analysis, measurement, and structure. Crowley-Henry (2009, p.61) refer to positivism as "a philosophy espousing that knowledge is objective, generalisable and quantifiable, and that such knowledge is best investigated through observation and measurement". Positivism works with an observable social reality to produce law like generalizations and often relies on deductive reasoning (Saunders et al., 2016). Ontologically, traditional positivists assume that reality (the world) is singular, objective, and independent and not affected by actions of the researcher/observer (Easterby-Smith et al., 2015; Collis and Hussey, 2014, p.343; Creswell, 2014). In positivism, the research can be value free (Saunders et al., 2016).

Interpretivism (see tables 3.3 and 3.4) is at the other end of the continuum. Interpretivism, a traditional philosophy, holds the assumptions that people see, interpret and experience the social world by creating meanings (Robson and McCartan , 2016; Saunders et al., 2016), and therefore requires the social scientists to embrace the subjective meanings of social action (Bryman, 2016). According to Collis and Hussey (2014), interpretivism assumes that social reality is highly subjective because it is shaped by human perceptions. Collis and Hussey (2014) further suggest that interpretivism focuses on exploring the complexity of social phenomena with a view to gaining rich insights and interpretive understanding of them. Robson and McCartan (2016) suggest the interpretivism research focuses on how individuals make sense of the world around them.

Value and subjectivity are integral part of the interpretivism research (Robson and McCartan, 2016, p.25).

Table 3.3 key features of positivism & interpretivism

Positivism	**Interpretivism**
Uses large samples.	Uses small samples.
Research is conducted in an artificial location or setting	Research is conducted in a natural location or setting.
Is concerned with formulating and testing hypothesis or hypotheses, or theories.	Is concerned with generating theories.
Produces precise, objective, quantitative data.	Produces rich, subjective, qualitative data.
Produces results with high reliability but low validity.	Produces findings with low reliability but high validity.
Enables the generalization of results from the sample to the population.	Enables the generalization of findings from one setting to another similar setting.

Source: Collis and Hussey (2014, p.50).

2.2.3.2 Pragmatism

Pragmatism (see table 3.4) is another key research philosophy. Saunders at al. (2016, p.143) assert that pragmatism holds the assumption that the most important determinants for the research design, strategy and method(s) are the problem to be researched and the research questions to be answered. Many other researchers (e.g. Collis and Hussey, 2014; Creswell, 2013, 2014) echo this theme of focusing on the research problem and answering the research questions. More specifically, some other authors (Feilzer, 2010; Hammond and Wellington, 2013; Robson and McCartan, 2016) suggest that pragmatists take a practical orientation towards resolving problems in the real world. Pragmatists are noncommittal to any one philosophical or methodological approach and can employ whatever approaches that work best to answer the research questions and address the particular research problem under investigation (Denscombe, 2014; Creswell, 2014; Robson and McCartan, 2016; Hathcoat and Meixner, 2017).

Pragmatism recognizes that there are both singular and multiple realities that are available to empirical inquiry (Feilzer, 2010, p.8). Pragmatist ontology perceives reality as complex, external and the practical consequences of ideas (Saunders et al., 2016). As a result, pragmatists uses multiple methods to capture the complex and external reality (Creswell, 2014). Within the ontological imperative, Graff (2017) suggests that pragmatists can view reality from two perspectives: (1) reality is outside the human that can be observed, measured and understood; and

(2) there is no one truth but there are multiple ways of explaining and constructing the reality (p.49).

Pragmatist epistemology emphasizes that knowledge is often constructed and derived directly from the participants' practical experience, and meaning and interpretation of the subject matter (Johnson and Onwuegbuzie, 2004; Easterby-Smith et al., 2015; Saunders et al. 2016). In a similar vein, pragmatist epistemology also focuses on gaining knowledge about the research problem from successful actions, consequences and practical outcomes of the research (Denscombe, 2010; Creswell, 2014). Morgan (2007, p.67) and Shannon-Baker (2017) suggest that pragmatist epistemology would place emphasis on shared meanings and joint action in order to create practical solutions to social problems. Furthermore, pragmatists also hold the view that knowledge (or truth) is provisional, arguing that knowledge cannot be absolute or perfect as it a product of our times (Denscombe, 2010). Pragmatic philosophy views knowledge as being fallible, and changing over time since it is a product of constant revision of experience and practice (Biesta, 2010; Biddle and Schafft, 2015). Martela (2015) provides similar account on pragmatism.

Pragmatist axiology assumes that the research is value laden and influenced and sustained by the researcher's doubts, beliefs and reflectivity (Saunders et al., 2016). It would appear that within the axiological imperatives of pragmatism, researcher's values such as reflexivity and explicit attention, and to the relationship between the researcher and the researched are important considerations in the research process (Biddle and Schafft, 2015).

Denscombe (2010) suggests that pragmatism rejects the distinctions or dualisms like facts/values, objectivism/subjectivism, positivism/interpretivist, etc. Meanwhile, Saunders at al. (2016, p.143) argue that pragmatism "strives to reconcile both objectivism and subjectivism, facts and values, accurate and rigorous knowledge and different contextualized experiences". Moreover, pragmatism provides a synthesis and middle ground between the features of dualisms such as positivism and anti-positivism, which are often regarded as irreconcilable and incompatible (Brandi and Elkjaer, 2008; Easterby-Smith et al., 2015). As suggested by some authors (e.g. Johnson and Christensen, 2014), pragmatists reject the incompatibility thesis where quantitative

research and qualitative research must remain separate and cannot be mixed, and advocated that both quantitative and qualitative research can be mixed successfully in single a research study.

According to Shannon-Baker (2016), "pragmatism is based on the belief that theories can be both contextual and generalizable by analysing them for 'transferability' to another situation" (p.322). Further, a universal tenet of pragmatism is the interconnectedness and iterativeness of theory and practice (Eldridge, 2009; McCready, 2010).

Pragmatism relies on abductive reasoning for solving the research problem (Morgan, 2007). In addition to abductive reasoning, pragmatism can be used in deductive or inductive research (Feilzer, 2010). Many authors (Biesta, 2010; Denscombe, 2010; Johnson and Christensen, 2014; Saunders at al., 2016; Shannon-Baker 2016) suggest that pragmatism is closely associated with the mixed methods research.

3.2.3.3 Critical realism

Next research philosophy is Critical realism (see table 3.4). According to Easterby-Smith et al. (2015, p.334), critical realism is a philosophy that assumes a more explicit ontological position, combining features of both positivism and constructionism (interpretivism). Easterby-Smith et al. (2015) further suggest that philosophy of critical realism places more importance on positivism than on interpretivism, and on theory building than on theory generation. Meanwhile, Saunders et al. (2016, p.138) suggest critical realists focus on providing an understanding and explanation for what they see and experience in relation the underlying structures of reality that shape the observable events or phenomena. Thus, this focus causes critical realists to undertake in-depth historical analysis of social and organizational structures and their changes over time (Reed 2005 cited in Saunders et al., 2016). Ashraf and Uddin (2015) suggest that critical realism is a philosophy that attempts to explain social phenomena through the concepts of emergence of power and properties derive from structures, depth ontology, and dualism.

Like pragmatism, critical realism rejects the extremes of both positivism and interpretivism (Belfrage and Hauf, 2016). McEvoy and Richards (2006) refer to critical realism as relatively new philosophy that offers a radical alternative to the established philosophies of positivism and

interpretivism. McEvoy and Richards (2006) suggest that "for critical realists, the ultimate goal of research is not to identify generalisable laws (positivism) or to identify the lived experience or beliefs of social actors (interpretivism); it is to develop deeper levels of explanation and understanding". The aim of critical realism is to produce critical knowledge to enable social emancipation (Belfrage and Hauf, 2016).

Saunders et al. (2016, p.139) suggest that critical realists considers two steps to experiencing and understanding the world (1) the sensations and the events that people experience and (2) the mental processing that goes on sometime after that experience.

Ontologically, critical realists argue that reality is viewed as reasonably stable and partly mind-independent (Modell, 2009). Moreover, critical realists accept that reality is external and independent of their beliefs and understanding of the world (Saunders et al., 2016), but reality is not directly accessible through their observation and knowledge (identification) of it (Saunders et al., 2016). In the same vein, a critical realist "does not see empirical observations as direct, or unmediated, reflections of some underlying reality", but recognizes that the reality can be based on a tripartite, 'stratified' ontology (Modell, 2009). From this stratified ontology, critical realists distinguish between three different ontological domains or modes of reality: real domain, actual domain and empirical domain (Modell, 2009; Easterby-Smith et al., 2015; Belfrage and Hauf, 2016), which are depicted in figure 3.1 below.

For example, Belfrage and Hauf (2016) identify three domains of reality for critical realism as 'real' structures or mechanisms, 'actual' things or events, and 'empirical' observations or experiences. Similarly, Easterby-Smith et al. (2015, p.59) suggest that ontologically, critical realism often differentiates three domains of reality as follows:

1. The empirical domain, which consists of the experiences and perceptions that people have;
2. Actual domain, which comprises events and actions that take place, whether or not they are observed or experienced or detected; and
3. Real domain, which comprises structures and causal power and mechanisms that cannot be observed or detected directly but have a real consequences for people and society.

McEvoy and Richards (2006) suggest that the real or 'deep' structures and mechanisms generate actual phenomena. According to critical realism, practitioners should aim at identify 'real' structures at work in order to change them so that inequalities and injustices may be eradicated or counteracted (Bryman and Bell, 2015, p.723).

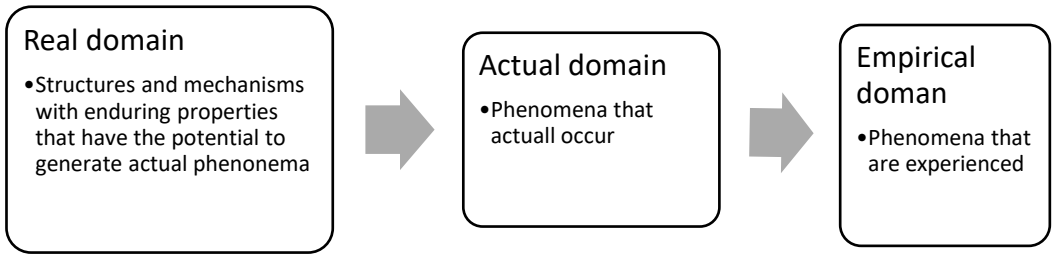


Figure 3.3 Three ontological domains of reality for critical realism

Source: developed from McEvoy and Richards (2006)

Critical realists within the axiological position acknowledge that their knowledge (identification) of reality is emanated from their social conditioning including socio-cultural background and experiences which may influence their research (Saunders et al., 2016). Therefore, critical realists must strive to minimize their biases and be as objective as far as possible in the research (Saunders et al 2016, p.140).

Critical realism follows a retroductive reasoning (reasoning backward from experiences) (Belfrage and Hauf, 2016; Saunders et al., 2016). According to Belfrage and Hauf (2016, p.255), retroductive reasoning or movement involves moving back and forth between observable phenomena and their possible explanations in an effort to a gain deeper knowledge of a complex reality, while making use of both qualitative and quantitative data to mainly identify trends and the researcher is being reflective in the process of producing knowledge. Accordingly, critical realism leans towards abductive reasoning and methodological triangulation using a mixed-methods research design (Modell, 2009). However, choice of methods for research underpinned by critical realism should be determined by the nature of the research problem (McEvoy and Richards, 2006).

3.2.3.4 Postmodernism

Postmodernism is the final research philosophy discussed in this research. According to Flick (2014, p. 12), "advocates of postmodernism (see table 3.4) have argued that the era of big narratives and theories is over. Locally, temporally and situationally limited narratives are now required" and acceptable by postmodernists. Bryman and Bell (2015) suggest that the micro or mini, or local narratives are acceptable and embraced by postmodernists because they are just stories that make no true claims. As Flick (2009) suggests, the theories and narratives should as far as possible fit the specific, delimited, local, historical situations and problems. Bryman and Bell (2015) also suggest that postmodernism opposes or rejects master-narratives (meta-narratives) that make claims about absolute truths and no alternative reality, and is skeptical about realism (which is associated to positivism) and is concerned with the modes of representation of research findings (p.726-727). Moreover, Bryman and Bell (2015) point that postmodernism is concerned with the different ways social reality can be constructed.

Easterby-Smith et al. (2015) identify three important features of postmodernism as follows: (1) it is generally critical of scientific progress for being discontinuous and contested; (2) it is associated with the movement that seeks to redress the excess of modernism; and (3) it contains ontological position that opposes realism/positivism but supports relativism/interpretivism (scientific laws are created by people, who have different views). Meanwhile, some studies (Cal´as and Smircich, 1999; Donaldson, 2003) identify four characteristics of postmodernism as follows: (1) incredulity (disbelief) towards metanarratives or grand narratives, which are to be replaced by local small stories; (2) the undecidability of meaning - there is no stable meaning of a text because any text has many possible interpretations; (3) the crisis of representation, and (4) the problematization of the subject and the author.

According to Bryman and Bell (2015), postmodernists considers knowledge as indeterminate and uncertain and open to constant revision. It has been embraced in qualitative research especially employing the ethnography strategy (Creswell, 2013; Bryman and Bell, 2015). Critical to the postmodernist research is the recognition that power relations between the researcher and researcher subjects tend to shape the knowledge created as part of the research process (Saunders et al. 2016). Postmodernism places emphasis on flux and flexibility, and the invisible elements and

processes of organizations (Easterby-Smith et al., 2015). In the context of reflectivity, Bryman and Bell (2015) emphasize that postmodernists should be aware of their personal idiosyncrasies and implicit assumptions that can influence their approach to research (p.715).

Table 3.4 Comparison of research philosophies and their philosophical assumptions

Type of philosophy	Ontology	Epistemology	Axiology
Positivism	Real; Reality is being external; One true reality; The world is made up of granular things; The world represents Order (ordered).	Scientific method; Observable and measurable facts; Facts & Numbers Observable phenomena Law-like generalizations Causal explanation and prediction as contribution.	Value-free; Research is detached, neutral and independent of what is researched; Research maintains an objective stance.
Interpretivism	Complex, rich. Reality is being socially constructed through culture and language. Multiple meanings, interpretations, realities Flux of processes, experiences, practices.	Theories and concepts too simplistic; Focus on narratives, stories, perceptions and interpretations; New understandings and worldviews as contribution.	Value-bound; Researcher is integral and reflexive in the research.
Pragmatism	Reality is complex, rich, external; Reality is the practical consequences of ideas; Flux of processes, experiences and practices.	Knowledge in specific contexts; True theories and knowledge are those that enable successful action; Focus on problems, practices and relevance; Problem solving and informed future practice as contribution.	Value laden research; Research initiated and sustained by researcher's doubts and beliefs; Researcher reflexive.
Critical realism	Stratified/layered (the empirical, the actual and the real) reality; External, independent Intransient ; Objective structures; Causal mechanisms.	Epistemological relativism Knowledge historically situated and transient. Facts are social constructions; Historical causal explanation as contribution.	Value-laden research Researcher acknowledges bias by world views, cultural experience and upbringing; Researcher tries to minimise bias and errors; Researcher is as objective as possible.
Postmodernism	Nominal Complex, rich Socially constructed through power relations Some meanings, interpretations, realities are dominated and silenced by others Flux of processes, experiences, practices.	Truth and knowledge are decided by dominant ideologies Focus on absences, silences and oppressed/repressed meanings, interpretations and voices Exposure of power relations and challenges of dominant views as contribution.	Value constituted research Researcher and research embedded in power relations; Some research narratives are repressed and silenced at the expense of others. Researcher is radically reflexive.

Source: Saunders et al. (2016, p.136)

3.2.4 The research philosophy adopted

This research investigates the current PMM practices within construction firms in St. Lucia. As mentioned earlier, PMM is typically considered to be a diverse multidisciplinary and complex subject (Chenhall and Moers, 2015), and therefore calls for multiple views to understand its diversity and complexity. PMM can be characterized as a process that contains both objectivity and subjectivity aspects in measurement. Micheli and Mari (2014) argue that the pragmatic perspective, which could be developed from the relativistic standpoint (i.e. from several different perspectives) and thereby can inform current debates in PMM.

This study adopts the Pragmatist philosophy because it deals with the rich and complex reality of PMM (see table 3.5). Furthermore, the pragmatist philosophy was adopted in this study because it embraces the eclectic and plural perspectives (i.e. using a range of research methods) in order to focus on the research problem, (Saunders at al., 2016). Further, the Pragmatist philosophy is justified in this study because it works within both objectivism and subjectivism perspectives to understand the diversity and complexity of PMM in practice (Saunders at al., 2016). This study leans more towards value-laden as advocated by pragmatism. The next section discusses research approach.

3.3 Research Approach

The research approach is the next layer of the research onion. Saunders et al. (2016) suggest that research approach places emphasis on theory development. Traditionally, the literature recognizes two contrasting approaches: deduction and induction (Babbie, 2013; Dray, 2014). More recently, literature has recognized a third approach, abduction (Margon, 2007; Saunders et al., 2016). These research approaches are discussed below.

3.3.1 Deductive approach

Deductive approach is where the researcher develops the theory and then tests the theory (hypotheses) in an empirical way in different situations, conditions and contexts (Gill and Johnson, 2010; Robson and McCartan, 2016). This case, researchers applying the deductive approach would first review and synthesize the literature to build the theory, which becomes a framework for the entire study (Creswell, 2014). Thereafter, the researcher would undertake data collection process

to identify the critical variables or concepts for the development of theoretical and/or conceptual framework, which then tested by empirical observation (Collis and Husssey, 2014). According to Saunders et al. (2016), deductive approach is highly formalised and structured for the analysis of data. Deductive approach is more likely to be associated with positivist philosophy (Gray, 2014; Saunders et al., 2016; Bryman, 2016), and objectivism.

3.3.2 Inductive approach

In contrast, the inductive approach is where the research starts with data collection (and analysis) to explore the phenomenon and then build theory with the analyzed data, which could be expressed as a conceptual framework (Saunders et al., 2016). This implies that the data drives the theory development. Similarly, Collin and Hussey (2014, p.7) suggest that inductive approach is where "theory is developed from the observation of empirical reality". Saunders et al. (2016) suggest that inductive approach is less structured and places heavy reliance on interpretation of data. Inductive approach is closely associated with interpretivism and subjectivism (Saunders et al., 2016).

3.3.3 Abductive approach

The abductive approach involves the collection of data to explore a phenomenon, identifying themes and explain patterns, place these in a conceptual framework and test this framework though subsequent data collection (Saunders et al., 2016, p.145). Meanwhile, abductive researchers move back and forth between induction and deduction approaches, and involves first in converting observations into theories and then assessing those theories through action (Morgan, 2007, p.71) or vice visa. This means researchers would move between the data collected and analysed and the literature. The abductive approach can be applied within pragmatism (Morgan, 2007).

3.3.4 Research approach adopted

This study adopts the abductive approach to move back and forth between inductive and deductive approaches in theory development. Moreover, the abductive approach was adopted because it is strongly associated with pragmatism, the philosophy adopted. The key variables or concepts of PMM identified from the literature review were used to develop an initial conceptual CPMM framework. These variables were deductively explored through a questionnaire survey of construction industry practitioners. The case studies, which encapsulating the semi-structured

interviews with construction managers and analysis of organizational documents, were used to inductively explore the data collected on the practices of PMM within construction firms. The finding from the questionnaire survey and the two case studies were used to refine the original conceptual framework. Furthermore, interviews (structured and semi-structured) with experts in the construction industry were conducted to validate the refined CPMM framework. The interviews question schedule that was used to conduct the validation of the CPMM framework is shown in **Appendix H.**

3.4 Methodological choice and coherence in research design

Creswell (2014, p.3) defines research design as the procedures of inquiry within qualitative, quantitative, and mixed methods research that provide specific direction in a research study. In this study, research design is the plan use to translate the research strategy(ies) into action to achieve the research aim, questions and objectives. The research design shows the interaction between theory and empirical investigation.

The three methodological choices a researcher can make to achieve a coherence research design include: quantitative, qualitative or mixed methods research (Creswell, 2014; Saunders et al., 2016). Saunders et al. (2016) divide each of the methodological choices into two types as outlined in table 3.5 below. For example, Saunders et al. (2016) distinguish between mono method (single data collection technique and procedure) and multiple method (more than one data collection technique and procedure) for both quantitative and qualitative studies. Furthermore, the mixed methods research can be divided into simple and complex research design (Saunders et al., 2016). Simple mixed methods research involves the use concurrent mixed methods research involves the separate use of quantitative and qualitative methods within a single phase of data collection and analysis. Saunders et al. (2016) argue that the complex mixed methods research involves multiple phases of data collection and analysis. For example, qualitative followed by quantitative, then a further phase of qualitative and versa visa. The complex mixed methods research is a very dynamic, interactive and iterative research process (Saunders et al., 2016).

Table 3.5 Types of Methodological choices

Methodological choice	**Type**	
Quantitative research	Mono method	Multi-method
Qualitative research	Mono method	Multi-method
Mixed methods research	Simple	Complex

Source: Saunders et al. (2016).

Table 3.8 shows the comparison between these three research designs. The three research designs are now discussed below.

3.4.1 Quantitative research

Quantitative research mainly produces or uses numerical data that are objective (Denscombe, 2010; Saunders et al., 2016). The relationship between variables are usually examined in quantitative research (Saunders et al., 2016). In quantitative research, reality is seen as static and measurable, objectivity is important, linearity (cause and effect) may be sought, outcomes are the main focus and pre-specified/developed hypotheses will dictate the research questions and approach (Gtbich, 2013, p.26). It emphasizes generalizability of results to a wider population as well as on predictability of the desired outcomes (Grbich, 2013). It generally uses probability-sampling techniques to achieve generalization.

Quantitative research focuses on the researcher's detachment (i.e. the researcher is a neutral observer of the phenomenon) and thereby maintaining a distance and objectivity from the subject of the research (Denscombe, 2010). It is usually aligned to positivism, predominantly deductive in reasoning, embraces natural scientific models and embodies objectivism (Bryman, 2016; Saunders et al., 2016). This implies that the conceptualization or theory-generation for quantitative research is often deductive from the evidence. It can also be used within pragmatism and critical realism philosophies (Saunders et al., 2016). Survey and experimental research strategies are primarily used in quantitative research (Grbich, 2013; Saunders et al., 2016).

An outline of the advantages and disadvantages of quantitative research identified in the literature appears in section 3.6.1.6.

3.4.2 Qualitative research

With qualitative research, "researchers need to make sense of the subjective and socially constructed meanings expressed by those who take part in the research about the phenomenon being studied" (Saunder et al., 2016, p.568). Similarly, Denzin and Lincoln (2018, p.10) suggest, "Qualitative research involves an interpretative, naturalistic approach to the world. This means that qualitative researchers study things in their natural settings, attempting to make sense of or interpret the phenomena under investigation in terms of the meaning people bring to them". Kumar (2014) points out that qualitative research focuses on the description and narration of feelings, perceptions and experiences rather on their measurements.

According to Bryman and Bell (2015, p.392), qualitative research "usually emphasises words rather than quantification in the data collection and analysis". Similarly, a distinctive feature of qualitative research is it generates or uses non-numerical data (Saunders et al., 2016). Another important feature of qualitative research is that it is oriented towards the "contextual uniqueness and significance of the aspects of the social world being studied" (Bryman and Bell, 2015, p.402). Furthermore, qualitative research is mainly concerned with gaining a better understanding of the research participants' meanings and perspectives of the phenomenon or situation being studied, and how they are shaped by the context in which that phenomenon takes place by using a range of interpretative practices (Maxwell, 2013; Denzin and Lincoln, 2018). Fellows and Liu (2008) add that the beliefs, understandings, opinions, views etc. of people are investigated in depth and detail in qualitative research. In the same vein, Kumar (2014) suggests that the focus of qualitative research is to understand, explain, explore, discover, and clarify situations, feelings, perceptions, beliefs and experiences of people (p.133-134).

Qualitative research often is associated with interpretivist philosophy and is viewed as an inductive approach to theory development (Grbich, 2013; Bryman, 2016; Saunders et al., 2016). Similar to quantitative, it can be used in pragmatic and critical realist philosophies (Saunders et al, 2016). Moreover, qualitative research places no or little emphasis on generalizations to the population (Kumar, 2014, p.14). Kumar (2014) also suggests that respondents' concordance or agreement occupies an important role in qualitative research.

Maxwell (2013) summarizes the key features of qualitative research as follows: (1) Understanding the meaning, for participants in the study, of the events, situations, experiences and actions they are involved with or engage; (2) Understanding the particular contexts within the participants act and influence that this context has on their actions; (3) Understanding the process by which events and actions take place (4) Identifying unanticipated phenomena and influences, and generating new "grounded" theories about the later (them); and (5) may develop causal explanations.

One disadvantage of qualitative research is that generalization of the findings to the population and other settings is difficult (Kumar, 2014; Bryman and Bell, 2015; Bryman, 2016). However, some researchers (Yin, 2014; Bryman and Bell, 2015; Bryman, 2016) suggest that qualitative research allows the generalization of findings to the theory rather than to populations. Yin (2014, 2018) refers to this as analytical generalization. Advantages and disadvantages qualitative research are shown in table 3.6 below.

Table 3.6 Advantages and disadvantages of qualitative research

Advantages	**Disadvantages**
It provides rich and deep understanding of the phenomenon or situation, i.e. called thick description (Bryman and Bell, 2015).	It tends to be too impressionistic and subjective (Bryman and Bell, 2015 Bryman, 2016).
It tends to be flexible and open, and has a limited structure for the enquiry (Kuram, 2014; Bryman and Bell, 2015; Bryman, 2016).	It is difficult to check for researcher bias (Kumar, 2014)
It generate results and theories that are understandable and credible (Maxwell, 2013)	Generalizations of the findings of qualitative research to the population and other settings is restricted as well as it is difficult to replicate (Bryman and Bell, 2015 Bryman, 2016).
It focuses on natural occurring events in natural settings and thereby can give a holistic overview of the context under the study (Miles, Huberman and Sadania, 2014).	It lacks transparency of how the research is undertaken (Bryman and Bell, 2015; Bryman, 2016).

Qualitative research have made use of the following main research strategies to gain an understanding of the phenomena under investigation: action research, grounded theory, case study, ethnography, and narrative research (Saunders et al., 2016).

3.4.3 Mixed methods research

Mixed methods research, according to Creswell (2014), uses a combination of quantitative and qualitative approaches in order to provide a better understanding of research problems in a single

study than either approach alone. Similarly, Biddle and Schafft, (2015) suggest that mixed methods research is concerned with combining of quantitative and qualitative data, methods, and approaches within single studies. Table 3.7 summarized the advantages and disadvantages of mixed methods research.

Bryman and Bell (2015) suggest that mixed methods research combines the use of both quantitative research and qualitative research, or quantitative (e.g. questionnaire) and qualitative (e.g. interview) research methods in a single study. When Bryman and Bell (2015) refer to mixed methods research, they mean combining research methods across two research strategies such as a survey and case study, which they called multiple-strategy research. In mixed methods research, emphasis is placed on collecting, analyzing and mixing both quantitative and qualitative data in a single study or a series of studies that investigate the same underlying phenomenon (Creswell, 2014; Sekaran and Bougie, 2016, p.106).

As suggested by some other authors (Feilzer, 2010; Denscombe, 2010, Creswell, 2014), mixed methods research tends to be largely associated with pragmatist philosophy. It is also associated with the philosophy of critical realism (Saunders et al., 2016). In mixed methods studies, theory can be used deductively, in quantitative theory testing and validity, or it can be used inductively for emerging qualitative theory or pattern (Creswell, 2014). Saunders et al. (2016) suggest that deductive approach or inductive approach or abductive approach to theory development can be used in a mixed methods research. According to Johnson and Onwuegbuzie (2004, p.17), the approach to theory development of mixed methods can include the use of induction (discovery of patterns), deduction (testing of theories and hypotheses), and abduction (uncovering and relying on the best of a set of explanations for understanding the study's results).

A key objective of mixed methods research is to capitalize on the strengths and minimize the weaknesses of both quantitative and qualitative methods in single research studies and across studies (Johnson and Onwuegbuzie, 2004, p.15). Some other authors (Denscombe, 2010; Gray, 2014) provide similar views.

Greene, Caracelli, and Graham (1989) identify five main reasons for employing a mixed-methods research in a study as follows: triangulation; complementarity; development; initiation; and expansion. These five main purposes are briefly discussed below:

- Triangulation is a technique that uses different research methods to investigate the same phenomenon in a research in order to enhance the derived findings of the research (Gray, 2014; Bryman and Bell, 2015);
- Complementarity in a mixed methods research involves combining quantitative and qualitative methods to assess overlapping but different elements or aspects of a phenomenon (Gray, 2014);
- Development in mixed methods research is where the findings of one method are used to inform the development of the second method and therefore building the whole analysis o the research (Denscombe, 2010; Gray, 2014);
- Initiation in mixed methods research is used to uncover paradoxes, provide new perspectives and contradictions; and new insights (Gray, 2014);
- Expansion in mixed methods research is used to broaden the range of the study (Gray, 2014).

Saunders et al. (2016) divide mixed methods into two types: mixed method simple and mixed method complex. There are several variations of mixed methods with emphasis on either quantitative research or qualitative research, or equal emphasis between quantitative research and qualitative research in the research process (Greene et al., 1989; Creswell, 2014). Creswell (2014) identifies the following major designs of mixed methods research: (1) Concurrent mixed methods research (uses of quantitative and qualitative research simultaneously); (2) Sequential exploratory design (begins with qualitative research, followed by quantitative research), and (3) Sequential explanatory design (begins with quantitative research phase, followed by qualitative research phase.

Table 3.7 Advantages and disadvantages of mixed methods research

Advantage	Disadvantage
It provide the best understanding of a research problem (Creswell, 2014).	It can be difficult and time consuming to conduct (Creswell, 2014,Gray, 2014; Kumar, 2014; Easterby-Smith et al., 2015)
It provides greater freedom to use the best research methods to deal with the complexity of the situations or research problems (Kumar, 2014).	There can be confusion regarding how the findings of mixed methods research can be integrated.
Draws on all possibilities; and diverse views (Easterby-Smith et al., 2015); It can enhance the research possibilities within a study (Kumar, 2014).	It can be difficult to synthesize and integrate the findings and interpretations from the two research approaches or strategies (Gray, 2014).
It can enrich the data and information as well as enhances the research findings (Kumar, 2014).	It may be difficult to resolve disagreement between the data sets (Kumar, 2014).
Increase validity (Easterby-Smith et al., 2015)	

Table 3.8 Comparison between the research designs

Quantitative research	Qualitative	Mixed methods Research
Tends to be associated with positivism (Denscombe, 2010; Bryman, 2016; Saunders et al., 2016).	Tends to be associated with interpretivism (Denscombe, 2010).	Uses pragmatism (Creswell, 2013; 2014); It uses both positivism and interpretivism.
Tends to be associated with analysing specific variables (Denscombe, 2010).	Tends to be associated with a holistic perspective of the problem or issues under study (Denscombe, 2010, Creswell, 2013).	Uses both specific variables and holistic perspective.
Quantifies the extent of variation in a phenomenon, situation or issue (Kumar, 2014).	Describes variation in a phenomenon, situation or issue (Kumar, 2014).	Quantifies and explores a phenomenon to enhance accuracy or yield greater depth (Kumar, 2014).
Provides greater emphasis on larger cases or sample size (Kumar, 2014).	Provides greater emphasis on fewer cases (Kumar, 2014).	Uses both larger sample size and small sample (Kumar, 2014).
Tends to be associated with researcher detachment (Denscombe, 2010).	Tends to be associated with researcher involvement (Denscombe, 2010).	Researcher is both detached and involved.
Provides narrow focus of enquiry (Kumar, 2014).	Provides broader focus of enquiry covering multiple issues (Kumar, 2014).	Provides narrow or broad or both (Kumar, 2014).
Uses numerical data that are objective (Denscombe, 2010; Saunders et al., 2016).	Generates or uses non-numerical data (Saunders et al., 2016).	Uses both types of data: numerical and non-numerical.
Looks for obvious trends or relationships among variables (Creswell, 2014).	Looks for obvious recurrent themes or issues (Creswell, 2014).	Uses both approaches.

3.4.4 The methodological choice adopted

The mixed methods research, which uses or mixes both qualitative research and quantitative research is adopted in this study. This research design allows the researcher to use an eclectic and pluralistic approach to research methods (such as survey and case studies) in order to collect a more diverse and suitable data on the subject matter. More specifically, sequential explanatory

design is adopted, where the quantitative data were collected and analyzed first, which was followed sequentially by the qualitative data collection and analysis (Creswell, 2014). In this research, equal weight and emphasis were placed on both quantitative and qualitative data and findings during integration, synthesis and interpretation. The rationale is that interviews and analysis of documents were conducted within the case studies. It should be note documentary evidence is more reliable than oral evidence and therefore increase the credibility of the case study findings.

The use of mixed methods research in this study is aimed at providing a more complimentary and broader understanding of PMM practices among Saint Lucian construction firms and to generate acceptable knowledge on the PMM practices. As suggested by some authors (Denscombe, 2010; Creswell, 2014), mixed methods research is associated with pragmatism, which is the philosophical assumption adopted in this research.

3.5 Purpose of research

3.5.1 Research purpose types

In designing a research, it is critical to establish its purpose(s). There are four purposes of research namely exploratory, descriptive, explanatory and emancipation purpose (Robson and McCartan, 2016). Saunders et al. (2016) adds a fifth, evaluative purpose. Some studies may have more than one purpose at the same time, depending on the situation and research questions (Robson and McCartan, 2016) especially when using mixed methods in the research design.

These purposes for designing a research is briefly explained as follows:

(1) Exploratory research permits researchers to clarify what is happening and gain an understanding of an issue or phenomenon (Saunders et al., 2016). It is also concerned with the investigation of a phenomenon in new or relatively unknown territory to lead to a better understanding of it (Mauch and Park, 2003). In a similar vein, Collis and Hussey (2014) suggest that exploratory research involves investigating a phenomenon in order to discern

patterns or develop propositions, when there is little or no information about the phenomenon.

(2) **Descriptive Research** is used to obtain an accurate profile or description of persons, events or situations or phenomena during a research (Robson and McCartan, 2016; Collis and Hussey, 2014; Saunders at al., 2016);

(3) **Explanatory (analytical) research** involves studying a phenomenon in order to understand, measure and explain the relationships between variables in some detail (Saunders at al., 2016);

(4) **Evaluative research** seeks to find out how effective something (e.g. system or process) is working and then comparing the results to existing theory (Saunders at al., 2016); and

(5) **Emancipation or empowerment purpose** facilitates action to bring about change or make improvements, and to influence policy or practice (Robson and McCartan, 2016).

3.5.2 Research type adopted

This study is more exploratory in purpose as its collection information to capture and discover the state of PMM practices in construction firms in Saint Lucia. Using the mixed methods research, researcher gained an in-depth understanding and insight into the performance measures used by construction firms in Saint Lucia to measure and evaluate their performance, as well as the uses of the performance measures, PMM frameworks in use within the construction firms and barriers that inhibit the successful implementation of PMM framework. Furthermore, this study follows a more exploratory type approach because PMM practices in Saint Lucia is relatively unexplored, and under-studied (See e.g. Denscombe, 2010; Collis and Hussey, 2014). This exploratory study identified key factors need to develop CPMM framework, based on initial quantitative research; and follow up by qualitative research to builds on and explore in detail the results of the initial quantitative research (as suggested by Creswell, 2009, 2014). Furthermore, this research also exhibits characteristics of a descriptive type, as it identified and described the key factors and features of PMM of Saint Lucian construction firms.

3.6 Research strategy

According to Bryman (2016), research strategy refers to a general orientation to the conduct of the research. Saunders et al. (2016) assert that the research strategy is the general plan of action that

will enable the researcher to answer the research question(s) and ultimately meet the aim and objectives of a study. In selecting the research strategy, the researcher should be guided by research aim/question(s) and objectives, research approach and purpose, and time horizon for the study (Fellows and Liu, 2008; Saunders et al., 2016). In addition, the choices of research strategies also depend on the extent of existing knowledge in the area as well as researchers' own philosophical stance (Saunders et al., 2016). Each strategy can be used for research types - exploratory, descriptive and explanatory research (Yin 2014), and emancipation research and evaluation research. The research strategies are explained next.

3.6.1 Types of research strategies

Action Research, ethnography, experiment, grounded theory, narrative inquiry, survey and case study are seven main types of strategies that can be applied in research (Saunders et al., 2016). These research strategies are discussed together with the justification for selecting or not selecting them. These research strategies would have an orientation towards deductive or inductive or abductive approach to research. **Table 3.9** shows the various research strategies for each research approach.

Table 3.9 Research strategies by research approach

Research approach	Research strategy
Deductive (quantitative)	Experimental research (Gill and Johnson, 2010); Survey research (Saunders et al., 2016).
Inductive (qualitative)	Ethnography (Saunders et al., 2016); Action research (Gray, 2014); Grounded theory, (Saunders et al., 2016); Narrative inquiry (Saunders et al., 2016); Case study (Eisenhardt and Graebner, 2007; Denscombe, 2010).
Abductive (mixed methods research)	Case study (Saunders et al., 2016); Grounded theory (Charmaz, 2014).

3.6.1.1 Action Research

Robson and McCartan (2016, p.199) asserts that the main purpose of action research is to influence or change some aspect of the focus of research. Similarly, Robson and Hussey (2014) suggest that it focuses on the involvement of the researcher in a particular situation or environment to bring about change and monitor the results of the change. Action Research is primarily concerned with bringing theory and practice together to change or make improvements in an organization (or some

aspect of it) by taking action and at the same time creating scientific knowledge or theory about that action (Coghlan and Brannick 2014; Easterby-Smith et al., 2015). This strategy is based on the premise that the researcher will immensely be involved in studying a practical problem of the organization to gain a better understanding of it (Denscombe, 2010), and to track the pace of changes or improvements within the organization (Braz et al., 2011; Gutierrez et al., 2015). According to Bryman and Bell (2015, p.419), action research is research strategy in which researcher and the client (researched) collaborate in the diagnosis of the problem and in the development of the solution based on the diagnosis.

Some authors (Braz et al., 2011; Gutierrez et al., 2015) identify the following as the key features of action research: it is participatory, it occurs simultaneously with the action; and it is a sequence of events and approaches used to solve problems over an extensive time period. This implies that action research is usually undertaken from a longitudinal study (Braz et al., 2011; Gutierrez et al., 2015), which typically requires significantly amount of fieldwork. Furthermore, action research strategy involves an iterative process of collaboration between the researcher and staff of the organization starting from the identification of problem(s) up to the development of new practical solutions to address the problem(s) (Bradley et al., 2009; Blass, da Costa, Pinheiro de Lima and Borges, 2016). Action research strategy is invariably used in qualitative research (Lodico, Spaulding and Voegtle, 2010).

Lodico et al., 2010; Bryman and Bell, 2015), which is influence by interpretivism (Collis and Hussey, 2014; Bryman and Bell, 2015). Coghlan and Brannick (2014) associate action research with the use of critical realism philosophy. In addition, Lodico et al. (2010) suggest that action research can be based on pragmatic philosophical position and therefore can be used in mixed methods research. Furthermore, action research can use a wide range of quantitative and qualitative data collection methods such as interviews, observation, documents, questionnaires (Lodico et al., 2010; Bryman and Bell, 2015).

Denscombe (2010) suggests that action research process has four main characteristics as follows: (1) practical nature (dealing with real-world problems and issues); (2) change (as a way of dealing with practical problems and as a means of discovering more about phenomena); (3) cyclical

process; (4) participation (active participation of practitioners in the research process). Meanwhile, Lodico et al. (2010) identify three steps in the process for conducting action research as follows (1) identification of the research problem through careful observation and reflection; (2) planning and taking appropriate action (study); and (3) using the findings to determine if organizzational practices or settings have improved or if further changes in an organizational practice or setting are needed. Both Denscombe (2010) and Lodico et al. (2010) highlight the importance of identifying and dealing with the problems through practical action to bring about change or improvement in a practice, process or organization.

A main advantage of an action research strategy is that it focuses on change, whereas a key disadvantage is that it is time consuming (Saunders at el., 2016). The advantages and disadvantages of an action research strategy are shown in table 3.10. Action research is not feasibility for this study because of the following: (1) the research is not longitudinal in nature, (2) actions for organizational change in PMM are not known to be taking place together with the research and thus the researcher is not tracking the pace of PMM system changes or improvements within the construction firms, and (3) time and resource constrains.

Table 3.10 advantages and disadvantages of action research

Advantages	Disadvantages
It is useful for effecting planned changes within a specific context (Saunders at el., 2016).	It may be time consuming (Saunders at el., 2016).
It is flexible research strategy (Lodico et al., 2010)	It concentrates too much on organizational action rather than on the research findings (Bryman and Bell, 2015).
It ensures credibility of research (Gray, 2014)	It causes the research to be constrained by what is permissible and ethical within the workplace setting (Denscombe, 2010).
It directly addresses practical problems and issues in a positive way, and feeding the results of research directly back into practice (Denscombe, 2010, p.134).	The researcher is unlikely to be detached and impartial in his or her approach to the research (Denscombe, 2010).
It contributes to professional self-development of the practitioners (Denscombe, 2010).	It tends to involve an extra burden of work for the practitioners (Denscombe, 2010).
It allows reflection on the outcomes of the study	It lack generalization of results (Denscombe, 2010)

3.6.1.2 Ethnography

Ethnography is where the researcher studies the social world or more specifically culture of a group of people in their natural setting of everyday activities (John and Gill, 2010; Saunders et al., 2016). The emphasis of ethnography is on capturing, describing and interpreting cultural behavior

of participants in real-world setting (Creswell, 2013; Grbich, 2013; Robson and McCartan, 2016). Usually, ethnographers immersed themselves in the settings in order to gain a better understanding of the meanings and significance that the members of the setting give to their actions and behavior (Easterby-Smith et al., 2015). In a similar vein, Collis and Hussey (2014) suggest that the ethnographic researcher should focus on gaining an interpretation and understanding of the social world that is very similar to that of the members of that particular social world. In some cases, researchers living among those whose they studied, to observe and talk to them in order to produce detailed cultural accounts of the shared beliefs, behaviors, interactions, language, rituals and events that shaped their lives (Saunders et al 2016, p.188).

Ethnography enables the researcher and members of group or organization to share experiences and involve in an iterative process of reflective discussions on the phenomenon being studied (John and Gill, 2010). John and Gill (2010) assert that ethnography is naturalistic, i.e. the researcher studies the social world in its natural setting and avoid disruption of the setting. Robson and McCartan (2016) suggest that ethnographic research entails three key features, namely, selection of a group or an organization, immersion of researcher in the setting; and use of participation observation (p.80). The decision to undertake ethnography research is influence by the following key factors research purposes, resources availability to the researcher, research setting, and aims of the study (John and Gill, 2010).

The ethnographic research strategy is associated with interpretivism (Collis and Hussey, 2014), and accordingly it is strongly rooted in inductive approach to theory development (John and Gill, 2010; Saunders et al., 2016). In ethnography, data and information can be collected from a wide range of data collection methods such as participation observation, document analysis, semi-structured interviews, and survey (John and Gill, 2010). However, it places more prominence on observation (Creswell, 2013). Table 3.11 shows the advantages and disadvantages of ethnography.

Table 3.11 Advantages and disadvantages of ethnography

Advantages	Disadvantages
Provides better insights about the phenomena being studied by combining both internal and external perspectives (Creswell, 2013).	It is very time consuming, intensive and it takes place over a prolong period of time (Creswell, 2013; Saunders et al 2016).
Provides a detailed description of behaviors, beliefs and values of a cultural-sharing group (Creswell, 2013; Grbich, 2013).	Researcher neutrality is usually difficult to maintain (Grbich, 2013, p.42).
It is flexible and emergent (John and Gill, 2010).	Access can be restrictive (John and Gill, 2010; Easter-Smith et al., 2015).
It can adopt multiple method approach (John and Gill, 2010).	It does not provide a protocol to guide the research process (John and Gill, 2010).

The researcher is not a member of the organizational settings in which the research occurs, and is not investigating the patterns of behavior of the participants or aspects of a socio-cultural phenomenon over prolong period of time, and thereby ethnography would not be appropriate for this study.

3.6.1.3 Experiment

According to Muijs (2011, p.11), experimental research can be defined "as a test under controlled conditions that is made to demonstrate a known truth or examine the validity of a hypothesis". Experimental research is a research strategy that systematically investigate the relationship between two variables, namely an independent variable and dependent variable (John and Gill, 2010; Collis and Hussey, 2014; Cooper and Schindler, 2014). In an experimental strategy, the researcher usually manipulates the independent variable in a setting and observes how it affects the dependent variable(s) or the subjects being studied (Collis and Hussey, 2014; Cooper and Schindler, 2014). Experimental research is useful in identifying and studying causal relationships between the variables (Collis and Hussey, 2014). Some authors (Creswell, 2012; Robson and McCartan, 2016; Saunders et al., 2016) argue that experimental strategy focuses on attempting to change the situation, circumstances or experience of the participants.

Furthermore, some authors (Denscombe, 2010; Bryman and Bell, 2015; Saunders et al., 2016) classify experiments into two categories, namely field experiment and laboratory experiment. Some key features of laboratory experiments include located 'on site', close control of variables and relatively shorter duration, whereas some key features of field experiments include

located ‘in the field’, use available possibilities and relatively longer duration (Denscombe, 2010, p.74). Bryman and Bell (2015) suggest the field experiment takes place in real-life settings such as in workplaces, whereas laboratory experiment occurs in a laboratory or a contrived (controlled) setting (p.53). One advantage of conducting experiments in laboratory settings rather than in field or natural setting is the conditions are more strictly controlled (Collis and Hussey 2014; Robson and McCartan, 2016). However, laboratory experiments are usually conducted in an artificial settings and isolation and therefore may fail to reflect the real world, as well as focused a very few specific variables as compared to field experiments (Collis and Hussey 2014). Furthermore, experiments conducted in natural or field settings tend to be more concerned with generalization and to have a greater validity, when compared to experiments in laboratory settings (Robson and McCartan, 2016).

Experimental research is closely associated with positivism philosophy, which supports a deductive approach and quantitative research (Collis and Hussey, 2014). Experiments can involve a wide range of methods of data collection including interviews, questionnaires and observation (Gibson and Brown, 2009).

A major advantage of experimental research is the researcher has greater control over the aspects of the research process (Saunders et al., 2016), while a key disadvantage of experimental research is control may be difficult to obtain (Denscombe, 2010). Table 3.12 shows the main advantages and disadvantages of experimental research.

Table 3.12 Advantages and disadvantages of experimental research

Advantage	**Disadvantage**
The research can be repeatable under different conditions (Denscombe, 2010; Collis and Hussey, 2014).	Ethical dilemmas such deception may arise in the research (Denscombe, 2010; Easterby-Smith et al., 2015).
It ensures clarity about what is being investigated (Easterby-Smith et al., 2015).	Gives rise to practical issues (Easterby-Smith et al., 2015).
The context for the research may permit a high level of precision (Denscombe, 2010).	Representativeness of the research subjects may be difficult to achieve (Denscombe, 2010).
It is convenience to the researcher since he or she does have go out of the field (Denscombe, 2010).	Control of the relevant variables may be difficult (Denscombe, 2010).
It is a credible strategy for research (Denscombe, 2010).	Usually it is conducted in an artificial setting and therefore may fail to reflect the real world (Collis and Hussey, 2014).

This strategy will not be appropriate for this study, as the researcher does not have control over the variables being studied in the research. Furthermore, experimental research is not associated with the philosophical position of this research, pragmatism and therefore, is not suitable for this study.

3.6.1.4 Grounded theory

Some researchers (Symom and Cassell, 2012; Charmaz, 2014; Birks and Mills, 2015; Saunders et al 2016) resting on the work of Glaser and Strauss (1967), suggest that grounded theory refers to the generation or construction of a theory that is grounded from the data collected about a phenomenon in the study. In grounded theory, the theory construction involves inductive data, simultaneous data collection and analysis, and coding and categorizing of data until saturation (Charmaz and Bryant, 2016). Moreover, the researchers would constantly interact with participants, and involve in constant comparison of data collected and analyze the data throughout the research process (Symom and Cassell, 2012; Charmaz, 2014; Charmaz and Bryant, 2016). In grounded theory, the researchers would involve in a continual interplay between the literature, other data and the emerging theory in order to make sense of the phenomenon being studied (Symom and Cassell, 2012).

There are some variations or versions in the processes of grounded theory in literature. Charmaz and Bryant (2016) identify the key processes of grounded theory research as data collection, coding, memo-writing, theoretical sampling and report writing. Each process is discussed below.

Data collection – data in grounded theory can be collected from many research methods. Interview is usually the primary data collection method (Creswell, 2013). Other forms of data collection methods include document analysis and observation (Bryman and Bell, 2015) and audiovisual material (Creswell, 2013). In grounded theory, the data collection and analysis happen simultaneously (Birks and Mills, 2015; Charmaz and Bryant, 2016). In grounded theory, the data is collected via theoretical sampling until theoretical saturation has been reached (Bryman and Bell, 2015) and patterns are identified in data, which are called categories.

Coding attempts to examine and breakdown the data apart and give them labels (names) (Bryman and Bell, 2015; Charmaz and Bryant, 2016), and define actions and processes (Charmaz and

Bryant, 2016). There are many different types of coding used in grounded theory research (Bryman and Bell, 2015). Charmaz and Bryant (2016) distinguish between two sequential types of coding: initial coding and focused coding. Initial (or open) coding is a way of identifying keys words or groups of words in the data collected and then label them accordingly (Birks and Mills, 2015, p.10). Birks and Mills (2015) further suggest that the initial coding is used to "fracture the data" (p.12). Moreover, the initial coding allows researchers to identify what is happening in fragments of data (Charmaz and Bryant, 2016) and produces concepts, which are then group into categories about the phenomenon being studied (Bryman and Bell, 2015). This process can also involve conducting line by line coding with gerunds to capture, and connect the fragments of data, as well as involves constant comparisons using line-by-line coding to identify broad categories (Charmaz and Bryant, 2016). Initial coding serves as the springboard for the generation of an emergent theory (Charmaz and Bryant, 2016).

In grounded theory, researchers conduct focused coding to construct codes that become tentative categories, to capture the most frequent and significant codes, see how they account for the entire data, to shape the direction of the data analysis and to forecasts its content (Charmaz and Bryant, 2016). Categories are saturated with data during the coding process when new data no longer suggest new dimensions of theoretical categories (Bryman and Bell, 2015).

Memo writing allows researchers to systematically record and track their ideas and thinking during the research process (Birks and Mills, 2015; Bryman and Bell, 2015; Charmaz and Bryant, 2016). Furthermore, memo writing entails exploring the codes and categories, and make constant comparison them and subsequently to the literature to identify gaps in the data (Charmaz and Bryant, 2016) in order to theoretical elaborate the categories that emerge (Bryman and Bell, 2015). The constant comparison maintains a close linkage and interplay between data and conceptualization (Bryman and Bell, 2015).

Theoretical sampling involves the following: identify categories and their properties (Bryman and Bell, 2015); filling out the properties of the tentative categories, identify variations in the process or phenomenon being studied, and establishing boundaries in theoretical categories (Charmaz and Bryant, 2016). Theoretical sampling increases the depth and precision of the

categories and the knowledge of the participants' situations (Charmaz and Bryant, 2016). Increases the theoretical understanding (Bryman and Bell, 2015).

Writing the report entails the researcher write down concepts or theory that evolved throughout the research process and reports the study to the audiences (Creswell, 2013; Charmaz and Bryant, 2016).

There is recognition that researchers can adopt the grounded theory strategy in different philosophical and methodological positions (Birks and Mills, 2015). Some authors advocate that grounded theory should be rooted in the interpretive (constructive) stance (Birks and Mills, 2015; Charmaz and Bryant, 2016). Meanwhile some other authors suggest that it should be associated with pragmatism (Corbin and Strauss, 2008; Denscombe, 2010). It can be associated with an inductive approach (Grbich, 2013; Saunders et al 2016). Symom and Cassell (2012) suggest that grounded theory is associated with an inductive approach, but can use an element of deduction to allow theoretical sampling to take place. Some other authors suggest that it could also be adopted in abductive approach (Suddaby, 2006; Charmaz, 2014).

Grounded theory is a useful research strategy when theories on a phenomenon under study are nonexistence or limited. In a similar vein, Symom and Cassell (2012) suggest that researchers can employed grounded theory to investigate rarely explored phenomena where an extant theory would be inappropriate (p.410). In such situations, this grounded theory may lead to novel and accurate insights of the phenomenon being studied (Symom and Cassell, 2012).

One main advantage of grounded theory is that it follows a vigorous process for the generation of concepts or theory (Bryman and Bell, 2015) such as using theoretical sampling and coding (Bryman and Bell, 2015; Charmaz and Bryant, 2016). On the other hand, a notable disadvantage of this research strategy is that it is time consuming, intensive, and an iterative and reflective process (Bryman and Bell, 2015; Saunders at el. 2016). Furthermore, it is challenging and difficult to implement in practice (Suddaby, 2006; Creswell, 2013; Bryman and Bryman, 2015). For instance, it is difficult to determine when categories are saturated or when the theory is sufficiently

detailed (Creswell, 2013). Table 3.13 below illustrates the advantages and disadvantages of grounded theory.

It should be noted that PMM has been extensively covered in literature. In addition, this research is time constrained. In light of these, the application of grounded theory in this research would be infeasible.

Table 3.13 Advantages and disadvantages of grounded theory

Advantage	Disadvantage
Its research process is fluid, interactive, and open-ended (Denscombe, 2010)	It is difficult to implement in practice (Suddaby, 2006; Bryman and Bell, 2015).
It can take various philosophical and methodological positions rather than subscribing to only one position (Birks and Mills, 2015), thereby providing flexibility	It does not lend itself well to systematic planning (Denscombe, 2010).
It is fairly adaptable, and pragmatic (Denscombe, 2010).	Prior conceptions of the researcher could influence the outcome of research (Denscombe, 2010).
Helps to develop different perspectives about a phenomenon (Symom and Cassell, 2012)	It is difficult to know when categories are saturated and when the theory is sufficiently detailed (Creswell, 2013, p.90)
It builds evidence from reality (Denscombe, 2010).	It is very demanding, time consuming, intensive and reflective (Bryman and Bell, 2015; Saunders et al., 2016).
It follows a vigorous process to the generation of concepts or theory such as using theoretical sampling (Bryman and Bell, 2015; Charmaz and Bryant, 2016).	It is difficult to see the generation of concepts or theory (Bryman and Bell, 2015).
It has the potential to provide detailed descriptive accounts of the phenomenon (Denscombe, 2010).	It provides little opportunity for generalization (Denscombe, 2010).

3.6.1.5 Narrative inquiry/research

Saunders et al. (2016) refer to narrative inquiry as a qualitative research strategy that is used "to collect the experiences of participants as whole accounts or narratives or which attempts to reconstruct such experiences into narratives" (p.721). Using this strategy, participant(s) will provide a personal and detail account of a particular context (Saunders et al., 2016). Creswell (2013) adds that narrative research focuses on "capturing the detailed stories or life experiences of a single individual or the lives of a small number of individuals" (pp.73-74). Researchers can use "restorying of the stories" i.e. gathering, analyzing, reorganizing and rewriting the stories into a general framework or narrative chronological sequence (Creswell, 2013).

According to Grbich (2013, p.201), the key defining feature of narrative research is "the stories are narrations of events which unfold sequentially over time". From a broader perspective, Creswell (2013) identifies the following key defining features of narrative research:

1. It collects stories from individuals about their lives and told experiences;
2. The narrative stories may provide insights on the identity of individuals and how they see or view themselves;
3. The stories are collected from different data collection techniques such as interviews;
4. The stories are heard and shaped by the researchers into a chronology which may comprise the past, present or future, although they may not be told that way by participant(s);
5. The narrative stories are usually context specific, that is they occur within specific places or situations;
6. The stories often contain turning points or tensions; and
7. The stories can be analyzed in many different ways.

There are many different types of narrative inquiries and Creswell (2013) emphasizes the four popular ones as follows:

1. **Biographical study** – the researcher writes and records the experiences of another person's life.
2. **Auto-ethnography** – the narrative stories are written and recorded by the individuals, who is the subject of the study. In addition, auto-ethnography provides wider cultural meaning for the individual story.
3. A **life history** reports a reflection of an individual's personal experiences during his or her entire life in a single or multiple episodes.
4. **An oral history** reports personal reflection of events and their causes and effects from one individual or several individuals.

Kumar (2014) notes that narrative inquiry is useful in sensitive situations. Chase (2011) suggests that narrative inquiry provides the opportunity to connect events, actions and consequences over time into a meaning whole. Saunders et al. (2016) suggest that narrative inquiry can be used on its own as the only research strategy or it can be a complementary strategy in an overall research design. Table 3.14 shows the advantages and disadvantages of narrative inquiry.

The narrative inquiry strategy is not appropriate in this research because of time constrained and this research is not investigating the personal narratives within a given context.

Table 3.14 Advantages and disadvantages of Narrative inquiry

Advantage	Disadvantage
Provide thick descriptions of contextual detail and social relations (Denscombe, 2010; Saunders et al., 2016).	It is intensive and time consuming (Saunders et al., 2016).
Generate large amounts of rich data. (Saunders et al., 2016).	It is very challenging to use because of its extensive data collection procedure requirements as well as its characteristics (Creswell, 2013).

3.6.1.6 Survey research

According to Krishnaswamy and Satyaprasad (2010, p.15), a survey is described as the collection of data directly from the population or a sample thereof in relation to an issue or phenomenon at a particular time. Survey is a popular research strategy that involves a structured way of collecting data from a sizeable population in a highly economical way (Saunders et al 2016). Bell (2014) claims that a survey strategy is largely a fact-finding enquiry. Typically, a survey would focus on collecting the same information or date about all the cases in a sample at a particular time (Blaxter, Hughes, and Tight, 2010). Moreover, the survey strategy may involve the collection of both qualitative and quantitative data (Denscombe, 2010; Dray, 2014). It is usually concerned with the generation of data from a particular sample to make generalization of results or from the population (Naoum, 2013; Collis and Hussey, 2014). Bryman and Bell (2015. p.63) broadly describe a survey strategy as cross-sectional design facilitating the collection of a body of quantitative data or qualitative data predominantly by questionnaire or by structured interview on more than one case and at a single point in time in relation to two or more variables which are then examined to identify patterns of associations.

Denscombe (2010) indicate that there are three key characteristics of the survey strategy namely: wide and inclusive coverage of the phenomenon being studied, the data are collected at a specific point in time, and it is an empirical research. Meanwhile, the data from the survey can be collected through either a self-administered or self-completion (postal, delivery and collection, and online or web based) survey and interviewer-administered (structured, focus group and telephone) survey

(Gray, 2014; Easterby-Smith et al., 2015; Robson and McCartan, 2016). Self-administered survey is where the respondents record their own answers, whereas the interview administered survey is where the interviewer asked the questions in the presence of the respondents and then record their answers or the interviewer contact the respondents by phone to asked them the questions and then record the answers they provide (Easterby-Smith et al., 2015; Robson and McCartan, 2016). The survey strategy is more associated with positivism and the deductive approach (Collis and Hussey, 2014; Robson and McCartan, 2016; Saunders et al., 2016).

A major advantages of survey research is that it can generate large amount of data at low cost (Saunders et al., 2016; Robson and McCartan, 2016). As expected, the survey strategy has some disadvantages. For example, it places more emphasis on breadth rather than on the depth of investigation (Denscombe, 2010; Saunders at el., 2016). Table 3.15 summarizes main advantages and disadvantages of survey strategy.

This study adopts the survey strategy because it provides a large amount of useful data over a short period at low cost, and has been used widley in previous studies on PMM practices (Ali et al., 2013; Bedford, Bisbe and Sweeney, 2018; Baird and Su, 2018). Moreover, the study adopts survey strategy to explore PMM practices from a wide range of construction firms throughout Saint Lucia. Furthermore, the survey data were triangulated with the data from qualitative research strategies.

Table 3.15 Advantages and disadvantages of survey

Advantages	**Disadvantages**
It is suitable for collecting large body of data at low cost that can be analysed statistically (Saunders et al., 2016; Robson and McCartan, 2016).	The data from surveys focus on providing snapshots of points in time rather than on the underlying processes and changes (Blaxter et al., 2010).
It can be a relatively cheap and quick way of obtaining large amount of data/information if is well structured and piloted (Blaxter et al., 2010; Denscombe, 2010).	The researcher is often not in a position to check firsthand the understandings of the respondents to the questions asked (Blaxter et al., 2010).
it can be relatively easy to administer; can be repeated in the future or in different settings to allow comparisons to be made (Blaxter et al., 2010)	It relies on breadth rather than depth for its validity (Blaxter et al., 2010; Denscombe, 2010).
It uses a sample as representation of population, which allows for the generalization of results (Naoum, 2013).	The characteristics (such cognition) of the respondents can influence the data (Robson and McCartan, 2016).
It gives the researcher greater control over the research process (Saunders at el., 2016).	Respondents may not truly report their belief and attitudes accurately (Robson and McCartan, 2016).
It provides high amount of data standardization that makes data analysis easy (Robson and McCartan, 2016)	Response rate could be low (Robson and McCartan, 2016; Cooper and Schindler, 2014).

3.6.1.7 Case study

Yin (2014, p.18) defines a case study as "empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident". A case study is a research strategy that makes use of multiple methods of evidence or data collection to investigate specific phenomena in their natural setting to obtain in depth knowledge (Gill and Johnson, 2010; Collis and Hussey, 2014; Robson and McCartan, 2016). Some other authors (Creswell, 2013; Bryman and Bell, 2015) suggest that case study provides researchers with an in-depth understanding of the case or cases under investigation. More specifically, a case study strategy permits the researcher to focus only on one instance or a few instances of a particular phenomenon with a view to gaining an in-depth account of events, relationships, experiences or processes occurring in that particular instance or instances (Denscombe, 2010, p.52).

Some common methods of data collection that can be employed in a case study strategy include but are not limited to interviews, direct and participation observation, archival records (Gray, 2014; Yin 2014, 2018), documentation or documentary analysis (Yin, 2014; Robson and McCartan, 2016) and questionnaire. It is imperative to note that a case study should emphasize the importance of the context or setting of the case (Yin, 2014; Robson and McCartan, 2016).

The case study strategy is often used in qualitative research (Gray, 2014; Robson and McCartan, 2016). However, case study strategy can be used in both qualitative and quantitative research (Yin, 2014; Robson and McCartan, 2016). Case study strategy can be used on its own in a research (Yin, 2014; Robson and McCartan, 2016), or it can be used in combination with other strategies as part of a larger mixed methods research (Yin, 2014), which is called multi- strategy designs by Robson and McCartan (2016). Case study strategy is appropriate for several research purposes including descriptive, explanatory, exploratory or evaluative purposes (Yin, 2014).

Case study strategy can be used in a many situations. According to Kumar (2014, p.155), case study design is very useful when exploring an area where little is known or when the researcher want to have a holistic understanding of a situation or phenomenon. Moreover, the case study strategy is particularly useful when the focus of the study is on extensively exploring and

understanding the phenomenon rather confirming and quantifying it (Kumar, 2014). Furthermore, Gray (2014, p.267) suggests that the case study strategy can be useful when the researcher is attempting to uncover a relationship between a phenomenon and the context it occurs.

3.6.1.7.1 Types of case study

Some authors (Collis and Hussey, 2014; Easterby-Smith et al., 2015) attempt to classify case study research into two main types, namely single case study and multiple case study (or comparative case study). Single case study research is based the in-depth examination of one single case, whereas multiple case study is based on the detailed investigation of multiple (more than one) case studies (Collis and Hussey, 2014). Baxter & Jack (2008) point out that multiple case study permits the researcher to understand the similarities and differences within and between the cases.

Yin (2014) proposes four types of case study design basis on two aspects: single or multiple case designs and holistic or embedded units of analysis. As suggested by Yin (2014), unit of analysis is the "case" to be investigated, which can include individuals, event(s), an entity(ies), communities, programs, practices, etc. The unit of analysis is "the main level at which the data is aggregated" (Easterby-Smith at el., 2015). Figure 3.4 depicts the four types of case study designs identified by Yin (2014). It can be seen from figure 3.4 that the single case study and multiple case study designs are disaggregated based on the unit of analysis.

Case	Single Case designs	Multiple case designs
Holistic (single unit of analysis)	Type 1 Single/holistic	Type 3 Multiple/holistic
Embedded (multiple units of analysis)	Type 2 Single/embedded	Type 4 Multiple/embedded

Source: adopted from Yin, 2014; Gray, 2014

Figure 3.4 Key types of case study design

As mentioned earlier, Yin (2014) distinguishes between single case study and multiple case study. Single case study involves an intensive investigation of only one case in a research (Yin, 2014; Bryman and Bell, 2015). Further, Yin (2014) claims that a single case is appropriate under the following five major circumstances or cases:

1. Critical case is one that is critical to the theory or theoretical propositions of the research;
2. Common or typical case focuses on capturing the circumstances and conditions of the everyday situation of an entity or community;
3. Unusual or extreme case is one that deviates from the theoretical norms or everyday occurrences of people;
4. Revelatory case is one where the researcher has gained access to conduct the empirical inquiry that can uncover some prevalent phenomenon, which was previously inaccessible to conduct; and
5. Longitudinal case is studying the case at two or more different points over time or studying trends within the case over a long period.

From the figure 3.4, it can be seen that Yin (2014) distinguishes between two types of a single case study design on the basis of the level of unit of analysis, namely holistic or single unit of analysis and embedded or multiple units of analysis. Type 1: single case study, holistic is where a single case study is examined at a holistic or global level such as investigating the global nature of a single organization or program or community (Gray, 2014; Yin, 2014). Whereas, type 2: single case study, embedded is where in a single case study the data are collected and subsequently analysed from the level of subunit or subunits of an entity such as investigating several departments within an organization or multiple projects within a program and so on (Gray, 2014; Yin, 2014). On the contrary, multiple case study involves examining two or more cases in depth in a research (Yin, 2014). Yin (2014) also differentiates between two types of multiple case study design based the level the unit of analysis. Type 3: multiple case study, holistic is where the researcher employs a holistic unit of analysis for multiple cases (Gray, 2014; Yin 2014). A key role of multiple case study, holistic is "to replicate the findings of one case across a number of cases" (Gray, 2014). Meanwhile, type 4: multiple case study, embedded is where embedded units (sub-units) of analysis are employed across multiple cases.

A single case study research can provide invaluable insights on the specific phenomenon under investigation and its context at a lower cost (Yin, 2014). In contrast, multiple case study research can generate more compelling evidence and the overall study (research process) is considered robust (Yin, 2014). Replication of the findings across cases is another advantage of multiple case

studies (Gray, 2014). However, undertaking multiple cases in a study requires extensive resources and time (Yin, 2014).

The literature articulates some common advantages of case study. For example, the case study can use multiple methods or source of evidence, which facilitate triangulation (Gill and Johnson, 2010; Yin, 2014; Robson and McCartan, 2016) and provides the researcher an opportunity to capture and address a wide range of issues within the case or cases (Gray, 2014; Yin, 2014). However, case study strategy is subject to some disadvantages. One drawback of case study is that it can promote selection bias, i.e. the inappropriate selection of subjects or cases (Yin, 2014). Table 3.16 below presents the advantages and disadvantages of case study strategy.

Table 3.16 Advantages and disadvantages of case study

Advantage	Disadvantage
It has the ability to use multiple methods of evidence or data collection techniques (Yin, 2014; Robson and McCartan, 2016).	Access to a suitable case or cases can be difficult to negotiate or gain (Gill and Johnson, 2010; Collis and Hussey, 2014) and therefore can affect rationale for the case study (Gill and Johnson, 2010)
The different methods or sources of data use in the research are based on the circumstances and the specific needs of the situation (Denscombe, 2010).	It is very time consuming and demanding (Collis and Hussey, 2014; Gray, 2014).
It can capture a wide range of issues on a phenomenon (Gray, 2014; Yin, 2014).	It can cause observer bias (Fellows and Liu, 2008).
It allows researchers to obtain in-depth insights about a particular phenomenon in its real life context (Yin, 2014).	It may give rise to the problem of selection bias (Yin, 2009),
It allows researchers to deal with the subtleties and intricacies of complex social situations (Denscombe, 2010).	The in-depth nature and complexity of a case may make analysis difficult and challenging (Saunders at el., 2016).
Replication of findings can occur through the use multiple cases, which increases the reliability of study (Gray, 2014).	It lacks credibility of generalizations (statistically) made from its findings to the wider population (Denscombe, 2010; Collis and Hussey, 2014; Gray, 2014).

The philosophical stance of this study is based on pragmatism, which is well aligned with the chosen approach of abduction. The adopted philosophy and research approach in this study were used to obtain both objectivist and subjectivist views and insights on PMM, which is a complex and dynamic, and contemporary phenomenon. In line with pragmatism and abduction, the study adopts multiple methods of data collection and analysis to obtain an in-depth understanding of PMM practices within the construction firms in Saint Lucia and of their local context, and to develop a CPMM framework as an enabler of performance improvement and benchmarking. The

case study strategy was adopted in the study because it works well within the pragmatist philosophical stance and abductive approach to theory development in order to address the research problem, answer the research questions and accomplish the research aim and objectives. Moreover, case study was chosen as a research strategy because the focus was to collect data from multiple sources (semi-structured interviews and documentary analysis) on the practices of PMM in the real-life setting or context of construction firms in Saint Lucia (Yin, 2014).

It important to clearly define and articulate the key perspectives of a case study such as the boundaries of the case study, unit of analysis and selection of cases, and to establish a conceptual framework for the case study. Each case study perspective is discussed below.

3.6.1.7.2 Case boundaries

Yin (2014) emphasizes the importance of establishing boundaries for a case, i.e. binding the case. According to Yin (2014, p.237), case boundaries can include "the time period, social groups, organizations, geographic locations, or other conditions that fall within the case". Yin (2014) went on to suggest that the case boundaries would assist researchers to determine and clarify the scope of the data collections. Along the same vein, Baxter and Jack (2008) suggest, "the boundaries indicate what will and will not be studied in the scope of the research project". This study investigates PMM practices of construction firms in Saint Lucia. **Therefore, the case boundaries in the cases for this study are construction firms, which are engaged in building, civil works, and construction related professional services in Saint Lucia.**

3.6.1.7.3 Unit of analysis

According to Sekaran and Bougie (2016, p.102), "the unit of analysis refers to the level of aggregation of the data collected during the subsequent data analysis stage". As mentioned earlier, the unit of analysis is "the main level at which the data is aggregated" (Easterby-Smith at el., 2015). Yin (2018) also suggests that unit of analysis is the "case" which can include an individual, event(s), an entity(ies), communities, programs, practices, etc. Very importantly, researcher should align the unit of analysis to the research questions, aim and objectives (Gray, 2014). The unit of analysis of this study is the **PMM practices in construction firms in Saint Lucia**, and hence study embraces Yin's (2014) "**type 3" holistic multiple case study** perspective. Accordingly, the

data were gathered from the questionnaire survey and semi-structured interviews of managers in the individual construction firms who are involved in PMM practices, and from the relevant documents of case study firms.

3.6.1.7.4 Case selection

Researchers need to decide on the number of cases that are adequate for investigation in a multiple case study and provide the rationale for them. The number of cases studied vary from study to study. Yin (2014) suggests that multiple case studies should use replication logic, i.e. where the researcher replicates the procedures for each case. Using multiple case study, "the cases should serve in a manner similar to multiple experiments, with similar results (a literal replication) or contrasting results (a theoretical replication) predicted explicitly at the outset of the investigation" (Yin, 2014, p.63). Yin (2014) also claims that researchers can use more cases in relation to theoretical replication, but further asserts that at **least two** cases that support either literal or theoretical replication can be used to capture an in-depth understanding of the phenomenon embedded in their context. In relation to multiple study, Creswell (2013) recommends that researchers can select up to **five cases** in order to obtain depth from each case. Creswell (2013) adds that researchers typically study a large number of cases where the focus of investigation is on generalization, which should not the focus of qualitative research. This study selects holistic multiple case study of two case studies in order to support the replication of the findings across the case study firms investigated (Gray, 2014) and to provide understanding of the themes and concepts of PMM within the Saint Lucian construction firms (Creswell, 2013).

For case selection, purposive or judgmental sampling was used because it allows the researcher to use his/her own judgement to select cases that permit the him/her to best address the research problem and ultimately achieve the research aim and objectives (Saunders et al., 2016). Another reason for selecting purposive sampling was to identify suitable cases that would produce the most valuable or "information-rich" data (Denscombe, 2010; Saunders et al., 2016) and reach the point of data saturation (Creswell, 2012). The two case studies were selected in this study on the basis that the researcher has previous knowledge that the case study construction firms are using or practicing PMM.

In multiple case study, the researcher can select similar cases and/or dissimilar cases. Researchers can select similar cases in an effort to show that the theory can be generalized (theoretical generalization) or select dissimilar cases in order to attempt to extend or modify any original theory (Collis and Hussey, 2014, p.69). In a similar vein, Yin (2014) asserts that the findings or results of a case study can be compared and contrasted with, and then support a particular set of concepts or theory to give rise to analytic generalization, i.e. generalizing the findings of a case study to other situations that were not previously studied. Gray (2014) claims the findings of one case can be replicated across a number of cases as well the theory can be replicated when two or more cases provide evidence to support the theory. Meanwhile, Creswell (2013) argues that researchers should select representative cases in a qualitative study to support generalization from one case to another.

In this study, holistic multiple case study was chosen in order to identify and analyze the themes, issues and trends about PMM in each individual case firm to generate findings; and then gain insights by comparing and contrasting the findings emanated from each. (Creswell, 2013; Bryman and Bell, 2015). The multiple cases in this study have illustrated different perspectives on PMM (Creswell, 2013). The case findings were also used to supplement the conceptual framework developed from the literature and questionnaire survey. It should be noted only two cases were selected because of time and resources constraints to undertake the research and achievement of data saturation.

3.6.1.7.5 Conceptual framework for the case study

It is important to establish a conceptual framework of a case study or the entire study. A conceptual framework of a case study covers the main features, variables, aspects, variables, and so on of the case study and their presumed relationship (Gill and Johnson, 2010). The conceptual framework can be viewed as a research roadmap that aims to ensure the research focuses on key aspects of PMM. An initial conceptual framework for the study was developed on the findings of the literature review and subsequently refined with the findings of the questionnaire survey. Furthermore, the findings from the case studies were used to further develop the conceptual framework that was built on the findings of the literature review and questionnaire survey. Chapter 9 provides a more detail discussion on the proposed conceptual framework.

3.7 Time horizon

Generally, the literature divides time horizon or dimension for conducting research into two categories, namely cross sectional study and longitudinal study. Cross sectional study aims at studying a phenomenon or phenomena at a single point in time (Phakiti, 2014; Bryman and Bell, 2015; Saunders et al., 2016) and provides a snapshot of a research phenomenon (Collins and Hussey, 2014). It is imperative to note that in cross sectional studies the data are collected once over a short period before they are analyzed and the findings reported (Collins and Hussey, 2014). Further, Collis and Hussey (2014) claim that time horizon can consider variables or groups of subjects in different context over the same period of time (p.63). For example, a researcher can conduct a survey on PMM practices within business organizations across several industries over the same passage of time to identify the similarities and differences between industries.

Researchers can conduct more than one cross sectional studies simultaneously over the same time (Collis and Hussey, 2014). A cross sectional study is useful when there are time and budget constraints or other limited sources to undertake a research (Collis and Hussey, 2014; Phakiti, 2014). Accordingly, one key advantage of cross-sectional studies is that it is economical and inexpensive (Collis and Hussey, 2014; Phakiti, 2014). In contrast, a drawback of cross-sectional study is that it does not give explanations or inferences about causal-like relationships or correlations (Collis and Hussey, 2014; Phakiti, 2014). Table 3.16 summarizes the advantages and disadvantages of cross sectional research.

Table 3.17 Advantages and disadvantages of cross sectional research

Advantage	Disadvantage
A short period is spent on data collection (Phakiti, 2014, p.9).	It does not give explanations or inferences about causal-like relationships or correlations (Collins and Hussey, 2014; Phakiti, 2014, p.9).
It provides good coverage of aspects of research with a large sample size (Phakiti, 2014, p.9; Easter-Smith et al., 2015).	It is not appropriate for research that focuses on understanding of the change process over time (Phakiti (2014, p.9; Easter-Smith et al., 2015).
It gives systematic comparability of variables between different groups of participants (Phakiti, 2014, p.9).	It is difficult to isolate the phenomena under study from all other factors that could influence the correlation. (Collins and Hussey, 2014).
It supports generalization of the findings to the larger target populations (Phakiti, 2014, p.9).	It may lack internal validity (Bryman and bell, 2015)
It is economical and inexpensive to conduct (Collis and Hussey, 2014; Phakiti, 2014).	

On the other hand, longitudinal study involves studying variables or events or a subject or group of subjects over an extended period (Collins and Hussey, 2014; Cooper and Schindler, 2014; Saunders et al., 2016). For example, a researcher can investigate the evolution or lifecycle (design, implement, use and assess) of a PMM system within a business organization over many years (see Braz et al., 2011; Gutierrez et al., 2015). It is more akin to a series of snapshots (i.e. investigating several times or continuously) on a particular research phenomenon over the time (Collins and Hussey, 2014; Cooper and Schindler, 2014; Saunders et al., 2016). In the same vein, some authors (Robson and McCartan, 2016; Sekaran and Bougie, 2016) point out that data can be collected at more than one point in time in a longitudinal study. According to Bryman and Bell (2015, p.67), longitudinal study provides some insights into the time order of occurrences of variables (i.e. one variable occurs before the other) and therefore may be more able to allow causal inferences to be made.

One major advantage of longitudinal study is that it can be used for investigating a specific phenomenon thoroughly to identify and track whether significant changes or developments occur over the time and explaining the changes or developments observed (Collins and Hussey, 2014; Phakiti, 2014). Conversely, one main drawback of a longitudinal study is that it can be very time consuming and expensive to undertake (Collins and Hussey, 2014; Phakiti, 2014; Robson and McCartan, 2016). Table 3.18 provide advantages and disadvantages of a longitudinal research.

Table 3.18 Advantages and disadvantages of longitudinal research

Advantages	**Disadvantages**
It can use small samples to generate large amount data and provide significant insights on the phenomenon (Collis and Hussey, 2014; Phakiti, 2014).	It is very time consuming and expensive to undertake (Collis and Hussey, 2014; Phakiti, 2014; Sekaran and Bougie, 2016).
It can allow researchers to thoroughly understand or observe or map the process of significant change or development of a phenomenon over the time period (Collis and Hussey, 2014; Phakiti, 2014; Bryman and Bell, 2015).	Some subjects can be lost (attrition) during the course of the study (Collins and Hussey, 2014; Robson and McCartan, 2016), which can impact on the outcome of the study.
It can establish sequences of events (Phakiti, 2014). It can establish direction and understanding about the casual influences of over time (Bryman and Bell, 2015).	The long time for conducting longitudinal studies is not very clear in the literature (Phakiti, 2014).

Cross sectional design was adopted in this study because it focuses on providing a complete picture of how PMM is being practiced within Saint Lucian constructions firms at a particular point in time, and because of time and budget constraints.

3.8 Research Technique and procedures

Researchers can deploy different types of data collection techniques (methods) and data analysis procedures to generate either quantitative or qualitative data, or both quantitative and qualitative data for a study. They are discussed in the following sections.

3.8.1 Data collection techniques/methods

Data collection methods are the different sources used to gather relevant data for a particular research. The selection of the data collection methods should be based on the research aims and objectives and the overall research design or the research questions (Robson and McCartan, 2016). There are two major sources for collecting data for a research study: they are the primary and secondary source of data collection (Collis and Hussey, 2014; Saunders et al., 2016), which are discussed below.

3.8.1.1 Secondary research data collection

Secondary data are results of studies made by others for their own purposes (Cooper and Schindler (2014), which are collected, stored within archival databases. Secondary data can be quantitative or quantitative data or both. In this study, the collection and analysis of secondary data from various sources will constitute literature review. Literature review and secondary data are from existing sources including academic books, journal articles, theses, dissertations, previous reports and databases (Collis and Hussey, 2014; Kumar, 2014; Phakiti, 2014).

A literature review is "a critical evaluation of the existing body of knowledge on a particular topic" (Collis and Hussey, 2014, p.76). Similarly, some authors (Kumar, 2014; Easterby-Smith et al., 2015) assert that a literature review is an analytical summary of the existing body of research coalescing around a particular research issue, problem or phenomenon. A critical literature review is undertaken to establish the context and theoretical foundation for the research (Saunders et al.,

2016, p.70). Similarly, Kumar (2014) posits that the literature review has two main purposes as follows: (1) it provides theoretical foundation of a study, and (2) it enables researchers to contextualise their findings by comparing them with the findings of other researchers in the area of enquiry. In addition to providing the theoretical framework for a study, literature review can assist in formulating the research problem or questions (Robson and McCartan, 2016). Moreover, a critical review of the literature allows researchers to gain a good understanding and insights into previous studies and the trends that emerged from them (Gray, 2014; Saunders et al., 2016). Some authors (e.g. Gill and Johnson, 2010; Gray, 2014) suggests that the literature review allows researchers to identify and select appropriate research methodologies and designs for their research.

Eisenhardt and Graebner (2007) suggest that the literature review could help researchers to identify gaps within the particular field of study and develop research questions that would address the gap. In a same vein, Kumar (2014) suggests that the literature review can help researchers to concentrate their studies on areas where there are gaps in the existing body of knowledge. Kumar (2014) suggests that the literature review is undertaken using four steps as follows: (1) searching for existing literature in your area of study; (2) reviewing the selected literature; (3) using it to develop a theoretical framework from which your study emerges and (4) also using it to develop a conceptual framework, which will become the basis of your investigation. It is important to acknowledge the advantages and disadvantages of literature review, which are presented in Table 2.19 below.

Table 3.19 Advantages and disadvantages of literature review

Advantage	Disadvantage
Provides a theoretical framework for a research (Kumar, 2014: Saunders et al., 2016)	It may cause researchers to focus on being more descriptive than critical review (Gill and Johnson, 2010)
It is an integral part to the entire research process (Kumar, 2014)	Tends to be time consuming and demanding (Kumar, 2014, Collis and Hussey, 2014).
Broadening researchers' knowledge base in their field of study (Kumar, 2014)	May content an element of uncertainty about the quality of the data (Easter-Smith et al., 2015)

This study conducts a critical review of the literature to identify key concepts of PMM in general, and in construction in particular, to select an appropriate research methodology that addresses the research questions and problems and identifies gaps therein. The main sources of information for

the literature review of this study include journal articles, books, international conference and seminar papers and other relevant materials available on the Internet.

3.8.1.2 Primary research data collection

Primary data are data or information collected from an original source(s) for the specific purpose for which the study is conducted by a researcher or by someone else. (Collis and Hussey, 2014; Kumar, 2014, p.378). Some common primary data collection methods that can be employed in a study include questionnaires, interviews, observation, documentary analysis and focus group (Creswell, 2012; Collis and Hussey, 2014; Saunders et al. 2016). Each of these primary data collection techniques and justification for using or not using them are now discussed in the following sections.

3.8.1.2.1 Questionnaire

Questionnaire is one of the most widely used research methods within survey strategy. A questionnaire is a pre-formulated set of carefully written and structured questions given to respondents to interpret and then record their answers to the questions (Sekaran and Bougie, 2013; Kumar, 2014). With the questionnaire, the respondents are usually asked to respond to exactly the same set of questions in a pre-determined order (Gray, 2014; Saunders et al., 2016). Researchers use the questionnaire to collect data about facts and opinions including attitudes, views, beliefs, preferences etc. of respondents, and to provide useful information on a particular point of interest (Denscombe, 2010). It can allow exploration of relationship between variables (Gray, 2014). Questionnaires can be used for description or explanatory research (Saunders et al., 2016).

A questionnaire can be a self-administered or interviewer-administered (Gray, 2014; Saunders et al., 2016). A self-administered questionnaires are usually distributed to the prospective respondents by mail or postal, in person and through internet (email or web-based) (Gray, 2014; Robson and McCartan, 2016). The online or internet questionnaire survey is usually the cheapest and quickest of the self-administered options (Gill and Johnson, 2010). Meanwhile, interviewed-administrated questionnaire is employed through face to face (structured interviews), and or by telephone (Gray, 2014). Generally, interviewer-administered questionnaires tend to have a higher response rate than self-administered questionnaires (Saunders et al., 2016). They can specifically

be administered and distributed individually and collectively to a study population (Collis and Hussey, 2014; Kumar, 2014).

There are two types of questions use in questionnaires: open and closed questions (Sekaran and Bougie, 2013, Bryman and Bell, 2015; Saunders et al., 2016). Open questions would provide longer, developed answers (Collis and Hussey, 2014). In contrast, closed questions require the respondent to only answer from a set of options that have been determined in advance by researcher (Sekaran and Bougie, 2013; Collis and Hussey, 2014). Furthermore, closed questions are usually preferred in questionnaire survey because their answers are easy to process, they enhance the comparability of answers and they are easier to complete (Bryman and Bell, 2015).

Whereas a questionnaire tends to give rise to researcher bias and non-response bias, it has key strengths of being economical and supplying standardized answers (Denscombe, 2010). **Table 3.20** presents the advantages and disadvantages of the questionnaire survey.

Table 3.20 Advantages and disadvantages of questionnaire surrey

Advantage	Disadvantage
It has the ability to produce large volumes of data in a short time period at low cost and wide coverage of all key issues pertaining to the area of research (Denscombe, 2010).	Its application is limited to a population (Kumar, 2014)
It provides standardized answers and pre code answers that can be easily analyzed (Denscombe, 2010)	Its response rate can be low and there is a self-selecting bias (Kumar, 2014)
It allows a large number of people to be reached in different geographical regions (Sekaran and Bougie, 2013).	The opportunity to clarify issues is lacking and spontaneous responses are not always possible (Kumar, 2014)
It is less expensive, as it saves time, and human and financial resources for undertaking the research, (Kumar, 2014).	The response to a given question may be influenced the response to other questions and by other people (Kumar, 2014)
It provides greater anonymity (Kumar, 2014).	It may be possible to consult others, and a response cannot be supplemented with other information from other methods of data collection (Kumar, 2014)
Often can be complete quickly (Denscombe, 2010)	Incomplete or poorly completed answers can impacts on the outcomes (Dencembe, 2010).

A questionnaire survey was conducted among the construction managers in Saint Lucia to initially explore and gain a general understanding of the practices and issues in PMM of construction firms, and to inform the qualitative stage of research. The exploratory questionnaire survey used a five-point Likert scale to measure the perceptions of participants on key variables or attributes that are

related PMM, which contributed to the development of the CPMM framework. The findings of questionnaire survey were used to inform and triangulate the qualitative findings of the interviews and documentary analysis within the two case studies. Creswell (2014) refers to this type of research design as sequential explanatory strategy, where the researcher conducts questionnaire survey first, followed by the qualitative semi-structured interviews and document analysis. The outcome of these stages of the study was used to refine the initial conceptual framework. The questionnaire comprised mainly closed-ended questions.

Questionnaire design: The questionnaire design was primarily based on the comprehensive and critical literature review. Moreover, the questionnaire survey was designed to be self-administered. Prior to the main survey study, pre-testing and pilot survey studies were conducted with the questionnaire survey of five respondents from the construction firms in Saint Lucia. The final version questionnaire survey (**see appendix E**) that was developed as well as an evaluation form for pilot study (**see appendix F)** were circulated to the respondents.

The insights gained from the study pilot survey were used to improve the readability, clarity, comprehensiveness, and relevance of the survey questions, and improve the design/structure of the questionnaire and procedures for the questionnaire. Piloting the questionnaire ensures that the research participants had no problems in understanding or answering the questions and have followed all instructions correctly and their responses provided a satisfactory indication of the reliability and validity of the questions and data collected (Saunders et al, 2016). In the same vein, the results of pilot survey shows that the majority of respondents agreed that the questionnaire was adequate to capture the key attributes of the subject matter, and contains definitions and descriptions that were useful to make the respondents gain a better understanding of the questions. Furthermore, two respondents suggested the need for additional definitions and guidance for some questions. All the necessary refinements were made to the draft questionnaire, giving rise to the final version of the questionnaire for main survey depicted **in appendix E**.

After the piloting phase, the final version of the self-administered questionnaire, accompanied by a covering letter were emailed and personally hand delivered to the targeted respondents or other appropriate senior level officials of the construction firms in Saint Lucia during the period May to

July, 2017. Significant amount of follow-ups were made to achieve a high or reasonable response rate during the surveying period. The follow-up strategies adopted include constant reminders were emailed to the target respondents, calls were made to target respondents and personal visits to respondents' firms as well as provided respondents the assurance that data collected from them in the questionnaire survey would be treated with utmost confidentiality.

The final questionnaire (**see appendix E**) for the survey was structured into two sections. The first section aims to capture demographic information about the respondents, including their education level, current position and working experience. The second section deals with questions on PMM practices within Saint Lucian construction firms. Further, the second section was divided into five sub-sections. Sub-section 2.1 asked respondents to rate the extent of using the different types of performance measures classified under seven BSC perspectives to assess the performance of their firms. The sub-section 2.2 requires information on types of PMM frameworks being used by respondents' firms. The sub-section 2.3 requires information on the uses of performance measures in PMM frameworks of respondents' firms. The sub-section 2.4 requires information on how the performance measures of respondents' firms are derived. In the final sub-section 2.5, respondents were required to rate how they perceive the barriers that could prevent the successful implementation of a new CPMM frameworks within their firms.

Participants' responses to all questions in section 2 on PMM were measured on a five-point Likert type scale ranging from 5 (to a very great extent) to 1(not at all), and 3 (somewhat/some extent) was the scale midpoint.

3.8.1.2.2 Interviews

A number of authors (Charmaz, 2014; Robson and McCartan, 2016) suggest that an interview is a method of collecting primary data by asking directly a sample of interviewees a series of questions and receiving their answers. A research interview involves interviewer conducting a meeting with the interviewee to discuss a set of assumptions and questions to gain an understanding about the situation or phenomenon under investigation (Denscombe, 2010). Interview is a widely used primary data collection method in research (Robson and McCartan, 2016). It is a main data collection method for case study (Yin, 2014). A research interview is a primary data collection

technique for gathering the qualitative data in a study (Cooper and Schindler, 2014). Besides helping researchers to obtain from explanations of key events from the interviewees, interviews can help researchers to obtain the interviewees' insights on the phenomena. Yin (2018).

Interviews can take place on a one to one (face to face) or in a focus group context (Robson and McCartan, 2016). Sekaran and Bougie (2013) suggest that interviews are particularly useful for the exploratory stage of a study. Easter-Smith et al. (2014) suggest that it is important for the researcher to do the following for a research interview:

1. develop trust in order to obtain the relevant information;
2. Be aware that the social interaction can influence the interview process;
3. Use appropriate attitude and language during interview process;
4. Get appropriate access;
5. Agree on the location for the interview; and
6. Record the interviews subject interviewee permission.

A researcher can choose from three main types of research interviews, namely structured interview, unstructured or in-depth interview, and semi-structured interview (Cooper and Schindler, 2014; Saunders et al., 2016; Robson and McCartan, 2016). Each type is discussed below.

Firstly, **structured interview** is where the researcher adopts tight control over the format of the questions and answers (Denscombe, 2010). Structured interviews often use interview guides or interview schedules or questionnaires with a predetermined and standardized or identical set of questions (Denscombe, 2010; Cooper and Schindler, 2014; Saunders et al., 2016). Researchers can utilize the structured interviews to collect quantifiable data and in this regard, they are also referred to as 'quantitative research interviews' (Saunders et al., 2016). With structured interviews, the respondents are invited to offer limited option responses and the wording of the questions is tightly control (Denscombe, 2010). Table 3.21 summarizes the advantages and disadvantages of structured interviews.

Table 3.21 Advantages and disadvantages of structured interviews

Advantage	Disadvantage
It is based standardization, which allows responses to be easily analyzed (Denscombe, 2010; Gray, 2014; Kumar, 2014).	It can be inflexible (Kumar, 2014)
It allows greater direct comparability of responses from participants and eliminates question variability (Cooper and Schindler, 2014; Kuma, 2014)	It can collect a limit amount of data (Denscombe, 2010).
Reduces the possibility of interviewer bias	Requires less interviewing skills (Kumar, 2014)

In contrast with structured interviews, unstructured interview does not articulate specific questions to be asked or order of topics to be discussed (Cooper and Schindler, 2014; Kumar, 2014). Unstructured interviews provide interviewees with a much wider scope to move the discussion to areas that they regard as important to them and allow them almost complete freedom to express their ideas and thoughts (Denscombe, 2010; Kumar, 2014). Unstructured interviews are useful for conducting preliminary interviews that will bring preliminary issues that might be relevant to a particular problem area. Furthermore, unstructured interview is usually informally conducted and the interviewer starts with one or few themes (or broad questions) to allow the interviewees to explore the phenomenon (Robson and McCartan, 2016; Saunders et al., 2016). Furthermore, the interviewer would establish a general area of interest and concern but would allow the conversation or discussion to develop within or around the subject area. Table 3.22 summarizes the advantages and disadvantages of structured interviews.

Table 3.22 Advantages and disadvantages of structured interviews

Advantage	Disadvantage
It gives the researcher flexibility to explore issues and topics of interest of the interviewees (Kumar, 2014)	The responses obtained may be difficult to analyze (Gray, 2014; Kumar, 2014)
It provides rich data and information(Kumar, 2014)	It can be time consuming (Gray, 2014)
It can deal with situations of complex and sensitive nature (Kumar, 2014)	It has the potential to introduce researcher bias in the study (Kumar, 2014)
	It requires much more interviewing skills (Kumar, 2014)

Finally, the semi-structured interviews lies between the continuum of structured interview end and unstructured interview end. Semi-structured interviews are ‘non-standardized in nature (Saunders et al., 2016) and are used in most qualitative research (Cooper and Schindler, 2014). Researchers

using semi-structured interviews will establish a list of themes and questions to be covered in the research (Saunders et al., 2016). They can be conducted face-to-face as well as over the telephone and online (Cooper and Schindler, 2014). Semi-structured interview is where the researcher uses an interview guide consisting of key questions, themes or prompts to be discussed on the research topic, and varies the order of asking questions based on flow of the interview (Saunders et al., 2016; Robson and McCartan, 2016). According to Robson and McCartan (2016), semi-structured interviews may provide unexpected answers to research questions.

Furthermore, the semi-structured interview method gives the researcher flexibility in terms of the order in which the topics are considered (Denscombe, 2014), and the opportunity to probe respondents on specific questions for more elaboration, explanation, and clarification on the point of interest (Denscombe, 2014; Robson and McCartan, 2016). Table 3.23 shows the advantages and disadvantages of the semi-structured interview.

Table 3.23 Advantages and disadvantages of semi-structured interviews

Advantages	Disadvantages
It collects rich and detailed set of data (Robson and McCartan, 2016).	It is not representative
It gives the researcher flexibility and adaptability during the interview (Denscombe, 2014)	It tends to be time consuming and expensive (Denscombe, 2014; Kumar, 2014; Robson and McCartan, 2016).
It allows probing of respondents (Denscombe, 2010; Cooper and Schindler, 2014).	Its lack of standardization of responses raises concerns about reliability and data analysis (Denscombe, 2010; Robson and McCartan, 2016).
It yields valuable insights on people's opinions, feelings, emotions and experiences on a phenomenon (Denscombe, 2010; Robson and McCartan, 2016).	Generalisation can be problematic (Robson and McCartan, 2016).
It yields high response rate (Denscombe, 2010).	It leads to biases such as researcher bias (Robson and McCartan, 2016; Kumar, 2014).

This study adopts the semi-structured interview because it offers the researcher an opportunity to explore the phenomenon in-depth with construction professionals, to be flexible in terms of asking questions in any order as necessary, and to probe respondents to gain clarity and elaboration on the phenomenon (Denscombe, 2010). Semi-structured interview was a main data collection technique employed for this study to gather the qualitative primary data within the case studies. The study deploys a sequential explanatory design where the results of the questionnaire survey

were used to inform the semi-structured interviews within the case studies, which further explored the PMM practice within Saint Lucian firms (Creswell, 2014).

Individual interviews with practitioners rather than group or focus group interviews were conducted in firms within the Saint Lucian construction industry. Face to face interviews were used in this study. Furthermore, organizational consent (**see appendix B**) was obtained from the gatekeepers (e.g. Principal) of the selected case study firms to gain access to their relevant data and information, and recruit appropriate participants from these case study firms. Following organizational consent, the participants were provided with a participant information sheet (**see appendix C**) that articulates the purpose of the research and their contribution and expectation in the research as well as an informed consent statement (**see appendix A**).

Interview questions and design: The semi-structured interviews were designed from the literature review and the results of the questionnaire survey. The questions for semi-structured interviews were mainly open-ended questions to provide deeper insights on PMM practices and issues in Saint Lucian construction firms (Denscombe, 2010; Cooper and Schindler, 2014; Kumar, 2014). The open-ended questions for the semi-structured interview provided the respondents some level of flexibility and freedom to answer in their own terms (Gill and Johnson, 2010; Kumar, 2014). In this study, participants were provided with the interview questions in advance of the semi-structured interview in order to assist them in preparing for the interview by reflecting on the questions, and to simulate their thoughts on the subject area in advance of the interviews as suggested by some authors notably Butcher and Sheehan (2010). The interview question schedule has three main sections. The first section composes of general questions related to background information about the respondents and their firm. The second section provides information about the aim and objectives of the research, and questions in third sections are related to PMM practices in the Saint Lucian construction firms.

Prior to the main study, the semi-structured interview was pre-tested with a sample of two construction professionals (a practitioner with over fifteen years' industry experience and holding a construction related MSc degree, and an academic holding a construction related MSc degree) in order to improve its understandability and unambiguity (Kumar, 2014). Further, semi-structured

interviews was pilot tested with one practitioner of a construction firm, with over ten years' industry experience in construction and performance management and holding a construction related MSc degree. The outcome of the pilot study was used to further refine and improve the design quality and validity of the instrument (Cooper and Schindler, 2014). Meanwhile, the results of the pre-test and pilot test were excluded from the final main study.

3.8.1.2.3 Document analysis

According to O'Leary (2017), documentary (Document) analysis is the "collection, review, interrogation, and analysis of various forms of written text as a primary source of research data" (p.375). Document analsysis is the exploration of written documents to establish categories and themes, and should focus on answering the research questions (O'Leary, 2017). Yin (2018) suggests that documentation is an important source of evidence in case study. Some authors (Bowen, 2009; Saunders et al., 2016) suggest that document analysis can help with triangulation of other data collected in the research. In a same vein, Yin (2018) posits that the findings of documentation can be used to corroborate and augment evidence from other sources.

Further, documents analysis is important in qualitative research because it provides information that contrast and/or complement information obtained from other methods such as interviews. From an organizational perspective, documents can be obtained internally with the organization and from the public domain (Bryman and Bell, 2015). Examples of such documents include minutes of meetings, letters, diaries, memoranda, speeches, newsletters, newspapers, pictures drawings, films, case studies and the like (Bryman and Bell, 2015; Robson and McCartan, 2016; Yin, 2018). Table 3.24 shows the advantages and disadvantages of the documents analysis.

Table 3.24 Advantages and disadvantages of documentary analysis

Advantage	Advantage
It is cost-effective way of collecting data and it is a permanent source of data (Denscombe, 2010)	The researcher needs to be cautious about documents since they may not accurately portray the perceptions of people in an organization (Bryman and Bell, 2015),
It is unobtrusive and non-reactive, therefore researcher presence does not influence the data collected (Robson and McCartan, 2016)	Produced for their own specific purposes rather than for the specific aims and objectives of the investigation (Denscombe, 2010; Robson and McCartan, 2016).
It can provide comparative and contextual data (Saunders et al, 2016)	Validity of information collected may be difficult to check for validity (Schmuck, 2006).
It may require fewer resources than other methods (Saunders et al., 2016).	They vary in quality because they may come from different sources, and make comparative analysis difficult (Saunders et al., 2016).
Provides cross validation and triangulation with other findings (Robson and McCartan, 2016)	It may be difficult to assess casual relationships (Robson and McCartan, 2016).
It can be reviewed repeatedly (Yin, 2014)	Access may be deliberately withheld (Yin, 2014)

The study adopts document analysis to complement data/information obtained from and triangulate the findings of other methods or sources used such as interviews (Bowen, 2009; Saunders et al., 2016; Yin, 2018). Some of the relevant documents from case study construction firms that were collected for analysis include annual and technical reports, performance reports, operational and strategic plan, organizational structure and minutes of official meetings.

3.8.1.2.4 Observation

Primary data of a study can also be gathered observation, which is common in qualitative research. Observation is concerned with systematically observing, recording, describing, analyzing and interpreting the behavior of people (Saunders et al., 2016), and is usually conducted in a natural setting (Sekaran and Bougie, 2013, p.130). It is method of collecting primary data by systematically watching and listening to an interaction or phenomenon as it take place (Kumar, 2014, p.173). Kumar (2014) suggests that observation is widely used in qualitative research but it can also be applied in quantitative research. Moreover, it can be used as a supportive or primary research (Robson and McCartan, 2016).

Some authors (Robson and McCartan, 2016; Saunders et al., 2016) suggest that observation is useful in investigating culture. Life style, beliefs of a social group. The literature identifies two types of observation in research, namely participant observation and structured (systematic)

observation. Participant observation is usually qualitative and places focus on discovering the meanings that people attach to their actions (Saunders et al., 2016). In participant observation, the researcher is usually immersed in the research setting to observe the particular phenomenon under investigation (Robson and McCartan, 2016; Saunders et al., 2016).

In contrast, structured observation is often quantitative and places more emphasis on the frequency of the actions such as in quantifying behaviour (Saunders et al., 2016). It involves high level of predetermined structure and quantitative analysis (Saunders et al., 2016; Robson and Mc Cartan, 2016). Structured observers often take a detached stance (Robson and Mc Cartan, 2016)

The main advantage of observation are its directness (Robson and McCartan, 2016), whereas one key disadvantage is that it is a time consuming and challenging process (Sekaran and Bougie, 2013). Table 3.25 highlights advantages and disadvantages of observation.

Table 3.25 Advantages and disadvantages of observation

Advantage	Disadvantage
It provides rich data on the phenomenon and is uncontaminated by self-report bias (Sekaran and Bougie, 2013).	It is time consuming and challenging because it requires the observer to be physically present for often-long periods (Sekaran and Bougie, 2013; Robson and Mc Cartan, 2016)
The behavior data are collected without asking observers questions (Sekaran and Bougie, 2013).	Reactivity (changing behavior) can be a major threat to the validity of the results of the observational study (Sekaran and Bougie, 2013).
It is possible to observe certain groups of individuals from whom it may be otherwise difficult to obtain information.	Data collected from observational study are likely to be prone to observer biases (Sekaran and Bougie, 2013; Gray, 2014).
Directness (Robson and Mc Cartan, 2016)	Ethical issues can be a concern

3.8.2 Population and sampling procedures

3.8.2.1 Overview

Saunders et al. (2016) defines the research population as "the full set of cases or elements from which a sample is taken" (p.274). Meanwhile a sample is a subset or subgroup of a population for a research study (Collis and Hussey, 2014; Kumar, 2014), which can be called the target population (Saunders et al., 2016). In some research, it might be possible to collect data from the whole population because it is of a manageable size or small size, whereas in other research, it might not

be practical to collect data from the whole population and as such, a researcher needs to select a sample that represents the whole target population (Saunders et al., 2016). It important for researchers to identify the sampling framework, i.e. the complete list of all the cases or elements in the study population, from which to select a sample (Collis and Hussey, 2014; Saunders et al., 2016). Researchers can deploy two main sampling techniques for selecting appropriate samples as follows: probability or representative sampling and non-probability or judgemental sampling designs (Robson and McCartan, 2016; Saunders et al., 2016). They are discussed in following sections.

Probability sampling design generally uses random selection of the sample from the population being studied (Denscombe, 2010). In probability sampling, each case in the population will have an equal chance of being included in the sample (Kumar, 2014; Robson and McCartan, 2016; Saunders et al., 2016). It is important that the sample in probability sampling represents the population (Robson and McCartan, 2016; Saunders et al., 2016). Probability sampling involves making statistical inferences about the characteristics of the research population can be made from the responses of the sample (Robson and McCartan, 2016; Saunders et al., 2016) and is often used in survey and experimental research strategies (Saunders et al., 2016). Examples of probability sampling designs include (1) simple random, (2) systematic, (3) stratified random and (4) cluster (Kumar, 2014; Robson and McCartan, 2016; Saunders et al., 2016).

On the contrary, non-probability sampling design is where the probability of selecting each case or element from the target population is not known (Saunders et al., 2016). In non-probability sampling, researchers have an element of discretion or choice at some point in the selection process (Denscombe, 2010). Non-probability sampling can be deployed where statistical inferences about the characteristics of the research population is not required (Saunders et al., 2016). Purposive or judgmental, quota, snowball and convenience are examples of non-probability sampling designs (Kumar, 2014; Robson and McCartan, 2016).

A description of all these sampling techniques is beyond the scope of this study. Accordingly, the simple random sampling and purposive or judgemental sampling are discusses below since they are relevant to the research. Simple random sampling involves the researcher selecting the sample

at random from the sampling frame (Robson and McCartan, 2016; Saunders et al., 2016, p.287). In simple random sampling, each case in the population as an equal chance of being in the sample (Kumar, 2014; Robson and McCartan, 2016).

On the other hand, purposive or judgemental sampling enables the researchers to make judgement in the selection of cases that will best allow them to answer the research question(s) and to meet research objectives (Saunders et al., 2016, p.287). Moreover, purposive sampling is used when a researcher purports that the selected participants (cases) have knowledge and experience about the phenomenon under investigation (Creswell, 2009; Denscombe, 2014), and can produce rich data or information and valuable insights on the phenomenon (Denscombe, 2014; Saunders et al., 2016). In the same vein, purposive sampling is appropriate for very small samples such as in case study research and grounded theory (Saunders et al., 2016).

3.8.2.2 Sample and participants for survey

Using a survey strategy, researchers need to specify the population and sample size (Saunders et al., 2016). In this research, the population/sampling frame for gathering the data entails Saint Lucian construction firms that are involved in building, civil work and construction related professional services. Further, the official Telephone Directory, Association of Professional Engineers of Saint Lucia listing and personal enquiry were used to determine the sampling frame (i.e. a complete list of all the construction firms in the population from which the sample will be selected). Each firm identified from the process was called to confirm their existence of operation. The operational existence of some firms could not be ascertained because either their phone number was disconnected or the calls were not answered. The final sampling frame developed from the process for the survey contains 47 Saint Lucian construction firms. Total population random sampling was used in this research for the quantitative data collection for the participants (cases). The target research participants are managers of the Saint Lucian construction firms who have experience in the construction industry and are responsible for their organizational PMM and strategy. They include Chief Executive Officers (CEOs), managing directors, principals, managing partner, and other senior managers of construction firms.

For a questionnaire survey, the researchers can involve the in selection of a representative or probability sample, or the selection of the entire population where the population is relatively small (or of manageable size) to gather the quantitative data (Collis and Hussey 2014). The question was "what is small population size". Some authors (Henry (1990 cited in Saunders, 2016; Cooper and Schindler, 2014) have attempted to define a small population, by suggesting that researchers should survey the full population under investigation where the population is up to 50 firms (or cases). Since the population is 47 firms, which is less than 50, the researcher conducted a total population survey or census using the questionnaire survey. Therefore, the total population sampling was adopted in this research for the quantitative data collection for the participants (cases). Accordingly, the questionnaire survey was sent to one manager of each of the 47 construction firms.

3.8.2.3 Sampling and participants for interviews

The research participants for the semi-structured interviews were selected based on purposive sampling technique to collect the qualitative data from the multiple case studies. Some author (e.g. Denscombe, 2010) suggest that purposive sampling is used in research where members of the population are deliberately chosen based on their knowledge on, and their relevance to the phenomenon under investigation. In this study, purposive sampling was used because research participants are assumed to have sufficient knowledge, experience and understanding in the area of performance measurement and management (Creswell, 2009; Denscombe, 2010). According, the actual participants for the semi-structured interviews were managers from of the selected case firms who are involved in the firms' performance measurement and management and strategy. Thirteen (13) semi-structured interviews with managers were conducted in this study **within two case forms in** the Saint Lucian construction industry. These interviews provided rich data, and cumulatively reached the point of data saturation.

3.8.3 Summary of research methods adopted

In light of the forgoing, table 3.26 presents an outlines the research methods adopted for the various research activities carried out throughout this study.

Table 3.26 Summary of research methods adopted in this study

#	Research activities	Data Collection methods				
		Literature Review	Questionnaire survey	interviews		Document analysis
				Semi-Structured	Structured	
1	Critical review of the extant literature on PMM and other related subject areas	√				
2	Explore the PMM practices within firms in construction industry in St. Lucia.		√	√		√
3	Develop a CPMM framework	√	√	√		√
4	Validate the CPMM framework			√	√	

Meanwhile, table 3.27 below outlines the data collection methods that were used in this study to achieve the research objectives.

Table 3.27 Research methods adopted for research objectives

Research objective	Research methods
1	Literature Review
2, 3 4, and 5	Questionnaire survey, interviews and documentary analysis
6, 7	Literature review, questionnaire survey, interviews and documentary analysis

3.9 Data analysis

Data analysis, which is an essential aspect of research process, incorporates data management, data analysis including data reduction and data interpretation (Bryman and Bell, 2015). Researchers could apply many data analysis procedures to analyze both qualitative and quantitative data collected for their study, which are discussed below. Before conducting any analysis, however, it is imperative to generate codes to facilitate both data collection and analysis in the study.

3.9.1 Coding

Coding and categories enable a researcher to analysis effectively the data collected in a study (Flick, 2009). Collis and Hussey (2014, p.162) suggest that coding enables researchers to cluster data into categories that share common characteristics in a research. As mentioned earlier, coding attempts to examine and breakdown the data apart and give them labels (Bryman and Bell, 2015;

Charmaz and Bryant, 2016). Codes can be words, phrases, paragraphs, labels, etc., that symbolically assigns salient attribute or meaning to a portion of the data set (Saldaña, 2013; Miles, Huberman, Saldaña, 2014). In this study, the coding unit is primarily based theme and therefore data are collected and analysis in relation to each potential theme. Saldaña (2013) refers to this as theming the data. Furthermore, Saldaña (2013, p.175) defines a theme as "an extended phrase or sentence that identifies what a unit of data is about and/or what it means". Usually a coding process can involve moving from codes to categories, to themes, to concepts, to assertions/theory (Saldaña, 2013). In this study, a concept is an idea or principle that applies to many individual categories, themes, or situations, whilst category is a group of codes. **Table 3.28** shows the coding frame adopted for this study. It can be seen from the coding frame, that a theme is generated from categories (sub-themes) and sub-categories.

The literature identifies different methods of creating codes, which could be based on the research strategy (e.g. grounded theory see section 3.6.1.4), research approach (e.g. inductive coding and deductive coding) or some other means. Deductive coding method starts with pre-set codes, categories and themes based upon the conceptual framework, research questions, research problem and key variables the researcher brings into the study (Miles et al., 2014). This coding approach helps in the delivery of well-organized data analysis. In contrast, inductive coding allows themes, categories and codes to emerge progressively from the data collected in the study (Miles et al., 2014). This approach is useful for the exploratory phase of a research. In this study both deductive and inductive approach to coding were used to generate themes and concepts.

As suggested by some authors (e.g. O'Leary, 2017), the theme coding adopted this study helps with the following:

- To provide meaningful understanding of the analyzed data;
- To search for patterns and interconnections in the data by explore the relationship between and among various themes;
- To map and build themes through deductively uncovering data related to a priori themes, and therefore the coding frame was predetermined as well as inductively discovering themes from the data and the coding frame was further built as the data analysis progresses;
- To establish/confirm concepts, and build and verify/confirm theories; and

- To drawing conclusions in relation the research questions and objectives.

Table 3.28 Coding frame for data analysis

Coding unit			
Theme	**Category (sub-theme)**	**Sub-category**	**Frequency**
Performance perspectives	Financial perspective	Net profit	
		Return on investment	
		Debt level	
	Customer perspective	Customer satisfaction	
		Number of customer complaints	
		Market share	
Use of performance measures	Measure performance		
	Strategy management		
	Managing risk		
Barriers to the implementation of a CPMM framework	Internal barriers	Lack of management support	
		Higher implementation costs	
		Inappropriate culture	
	External barriers	Competition level	
		Economic uncertainty	
		Political uncertainty	
Etc.	Etc.		

3.9.2 Quantitative data analysis

Researchers can analyze quantitative data manually or using computer-based analysis software ranging from spreadsheets such as Excel to more advanced data management and statistical analysis software packages such as Minitab and Statistical Package for the Social Sciences (SPSS) for Windows (Collis and Hussey, 2014). This study adopts SPSS version 23 for Windows as well as Microsoft Excel to carry out analyses on the collected quantitative data to meet the research objectives. These statistical packages are used in this study because they are most widely used for analyzing a large quantitative data set in an efficient manner.

Researchers can use SPSS software to undertake three types of tests to analysis quantitative data, namely univariate analysis, bivariate analysis and multivariate analysis. Based on the literature (Collis and Hussey, 2014; O'Leary, 2017), a brief discussion is provided below:

- Univariate analysis involves the statistical analysis of data pertaining to one variable, which includes measuring the central tendency, dispersion and distribution.

- Bivariate analysis is a statistical analysis of data to determine the relationship between two variables. Chi-squared test and correlations are common examples of this test.
- Multivariate analysis is a statistical analysis of data that explore the relationship between three or more variables. Factor analysis, structural equation modelling and multiple regression are some examples of this test.

Researchers can utilize both descriptive statistics and/or inferential statistics in their research. According to Collis and Hussey (2014, p.226), descriptive statistics summarize, describe and display quantitative data into a compact form that allow patterns to be discerned, whereas inferential statistics are used to draw conclusions about a population from the quantitative data based on a random sample. Generally, at high-level research, researchers are like to use descriptive statistics at the preliminary stage and then utilize inferential statistics through bivariate analysis and/multivariate analysis at the other stage(s) (Collis and Hussey, 2014).

Using descriptive statistics, this study can analyze, describe and discern the patterns of the quantitative data set from the generated summary statistics in the forms of central tendency (mode, mean, median), frequency distribution (percentage frequencies) and dispersion (range, variance, standard deviation). Researchers can utilize SPSS to generate frequency, tables, charts, and cross tabulation and perform a range of statistical tests quickly and accurately (Collis and Hussey, 2014). Furthermore, the descriptive statistics helps this research to discern and understand not only the demographic and variable characteristics of respondents but also the variables on PMM within construction firms in Saint Lucia. Descriptive statistics are usually associated with univariate analysis, which assesses one variable in a data set.

In addition to descriptive statistics, researchers should consider applying inferential statistical so that they can make inferences about the target population based the data collected from the sample. Inferential statistics can perform two types of tests namely parametric test Non-parametric tests (Collis and Hussey, 2014). O'Leary (2017) suggest that parametric tests involve the assumptions that the target population under investigate is within the normal distribution, whereas Non-parametric tests are where the data do not follow the assumptions of normal distribution.

The type(s) of statistical test deploy in a research will be determined by the research questions, time and resource availability and the statistical knowledge of the researcher. It is imperative to note that time and resource constraints limit numbers of tests carried out in the study. In addition to descriptive statistics, the study deploys only two main inferential statistical techniques on the quantitative data set as follows: (1) internal reliability test using Cronbach's alpha coefficient and (2) factor analysis using principal components analysis in order to reduce the data to composite variables.

3.9.3 Qualitative data analysis

Each interview was audiotape recorded with the permission of participants or note recorded, transcribed and then analyzed using qualitative data analysis (QDA) to generate qualitative data. In the same vein, researchers can deploy two main QDA techniques, namely thematic analysis and content analysis, the discussion of which are provided below.

Thematic analysis is used in a study to identify, codify, analyze, interpret and report themes or patterns within qualitative data collected (Braun and Clarke, 2006; Clarke and Braun, 2017). Bryman and Bell (2015) define thematic analysis as a QDA technique that aims at the extraction of themes in a qualitative data set. It important to note that themes should capture something essential about the data in relation to the research questions and objectives (Braun and Clarke, 2006) and form the basis for further qualitative data analysis and interpretation (Robson and McCartan, 2016). Moreover, the themes allow researchers to make sense or give meaning to the data set. As suggested by Robson and McCartan (2016), thematic analysis can inductively applied where the codes and themes emerge mainly from the researcher's interaction with the data; and/or it can be deductively applied by using predetermined codes and themes from the literature review and/or the research questions. Similarly, Clarke and Braun (2017) suggest that thematic analysis can be used for both inductive (data-driven) and deductive (theory-driven) analyses (p.298).

Relying on the work of Braun and Clarke, 2006, Robson and McCartan (2016) identify five phases for the use of thematic analysis in research as follows:

1. Data familiarization involves noting initial ideas, read and re-read the transcribed data, and checking transcripts against original recordings;

2. Generating initial codes involves coding or giving codes to interesting and important features of the data in a systematic way across the entire data sets to generate meaning data groups and collecting data relevant to each code;
3. Identifying themes primarily involves collating codes into potential themes and subthemes, and gathering data relevant to each potential theme, revising the initial codes and themes if necessary;
4. Constructing the thematic networks by grouping themes into networks using thematic maps; and ensuring that the themes that make the networks reflect the data and the data support the themes; and
5. Integration and interpretation of themes, patterns and trends to generate meanings, and making comparison between aspects of the data.

Braun and Clarke (2006) suggest that thematic analysis differs from content analysis in that themes tend not to be quantified and may be quantified, whereas content analysis mainly focuses on providing counts (frequency) of the identified key words or themes from text. Table 3.29 summarizes the advantages and disadvantages of thematic analysis.

Table 3.29 Advantages and disadvantages of thematic analysis

Advantage	Disadvantage
Very flexible data analysis method	Its flexibility can present researchers from deciding what aspect of the data to focus on.
Ease and quick method to learn and use	Can be limited to description or exploration with little emphasis on interpretation.
Summarizes key features of large amount of qualitative data	It currently has no received kudos as an analytic method.
It can generate unanticipated insights	Lacks a clearly specific set of procedures (Bryman and Bell, 2015, p.601)

Sources: Braun and Clarke, 2006, pp. 97-98; Robson and McCartan, 2016, p.470.

Conversely, content analysis is a QDA that codes and quantifies the contents of textual data collected from research instruments (Denscombe, 2010). As suggested by Saunders et al. (2016), content Analysis is a QDA technique that codes and categorizes qualitative data in order to analyze them quantitatively (p.608). Collis and Hussey (2014) suggest that content analysis is a QDA technique that systematical identifies the main coding units (words, phases, items or themes) that

emerge from the qualitative data set and then converted them into numerical data for analysis. Similarly, Grbich (2013) suggest that content analysis allows researchers to explore large amount existing textual data in order to determine the trends and patterns of words used, their frequency, their relationships and structures, contexts, and discourses of communication (p.190).

Generally, there are two main approaches to content analysis, namely enumerative and ethnographic. Enumerative content analysis provides a numeral overview, whereas ethnographic content analysis provides a numeral overview as well as some thematic analysis to give more depth of explanation of, and to situate the data (Grbich, 2013). The enumerative approach has dominated content analysis (Grbich, 2013). Table 3.30 shows the advantages and disadvantages of content analysis.

Table 3.30 Advantages and disadvantages of content analysis

Advantages	**Disadvantages**
A flexible technique that can be applied in a wide variety of contexts or phenomena (Bryman and Bell, 2015; Saunders et al., 2016).	Difficult to assess causal relationships (Saunders et al., 2016).
Analyses and simplify large amounts of qualitative data where the aim is to describe them quantitatively (Grbich, 2013; Saunders et al., 2016).	The need for coders to interpret meaning may undermine content analysis (Bryman and Bell, 2015).
May allow researchers to observe patterns and relationships in the data set (Grbich, 2013; Saunders et al., 2016).	Seen as too positivist in orientation (Grbich, 2013).
Can be applied in in all kinds of data, textual and non-textual (Easter-Smith et al., 2015).	May provide minimal interpretation due to the enumerative data and information Grbich, 2013).

The study adopts thematic analysis to analysis the qualitative data set because of its flexibility and ease of application. Moreover, the study adopts thematic analysis to identify, codify and analyze the predetermined themes as well as emerging new themes or patterns within the qualitative data set. In interpreting the analyzed data, repetition of codes, themes and sub-themes was used to demonstrate their level of importance in the data. Similarities and differences within the data, and metaphors that reflect key codes or themes in the data were also identified.

The qualitative data analysis process can be done both manually, and with the aid of a computer assisted qualitative data analysis software (CAQDAS) (Robson and McCartan, 2016). Using

CAQDAS software during qualitative data analysis will help in maintaining continuity and enhance both transparency and methodological rigour (Lewin and Silver, 2009, p.6). NVivo is an example of CAQDAS, which can be used in qualitative data analysis (Bazeley and Jackson, 2013). The NVivo software will help the researcher with the qualitative data analysis to manage data and ideas, query data, visualize data and report from the data to support the conclusions (Bazeley and Jackson, 2013). Recognized the usefulness of NVivo software, The QDA process was performed manually in this study since the researcher is very familiar with manual approach.

Since this study adopts multiple case study, individual (within) case analysis was first conducted where data collected from each case was analysed for identifying themes and patterns. This was then followed cross-case analysis of the data from the multiple case study to identify and discern themes that are common and different to the two case studies (Creswell, 2012, 2013, 2014), which could facilitate analytic or theoretical generalization to other situations (Robson and McCartan, 2016; Yin, 2014, 2018).

3.10 Trustworthiness of research

The trustworthiness of the research was established in terms of its validity and reliability (Collis and Hussey, 2014; Robson and McCartan, 2016). Collis and Hussey (2014, p.345) describe validity as "the extent to which a test measures what the research wants it to measure and the results reflect the phenomenon under study". Construct validity, content validly and external validity are three important types of validity in a research. Yin (2018, p.286) suggests that construct validity is "the accuracy with which a study's measures reflect the concepts being studies". This implies that the research instruments should measure the concepts or constructs they were designed to measure. According to Kumar (2014), content validity is the assessment of the items of a research instrument or of measurement process as well as determining the extent to which the research questions represent the issue they are supposed to measure. Yin (2018, p.287) defines internal validity as the strength of a casual or other inferences make in a study. Meanwhile, external validity shows to which the findings from the study can be generalized to other situations or places that were not part of the original study (Yin, 2018).

To demonstrate validity, several validity procedures were incorporated in the study as follows:

- Construct validity was achieved as follows: established appropriate documentation of evidence (e.g. using audit trial and case study protocol), (Robson and McCartan, 2016; Yin. 2018); used triangulation i.e. multiple methods of evidence or data collection (Denscombe, 2010; Robson and McCartan, 2016; Yin, 2018) and used appropriate statistical procedures such as factor analysis (Creswell, 2012; Cooper and Schindler, 2014, Kumar 2014);
- Content validity was achieved through extensive literature review, and pre-test and pilot studies (Saunders et al, 2016) and proper alignment of the research questions with the research objectives (Kumar, 2014);
- Internal validity was achieved as follows: used a protocol for data collection, process pattern-matching, triangulation (Yin, 2018), used a rigorous coding, performed synthesis of empirical findings within literature;
- External validity (generalizability) was achieved as follows: performed inferential statistical analysis (Robson and McCartan, 2016), placed emphasis in obtaining a high or acceptable response rate from participants in the study (Creswell, 2012) and undertook cross-case analysis/synthesis (Yin, 2018).

Another important aspect of trustworthiness or credibility of the research is reliability. The reliability measures the consistency and accuracy of the results obtained in the study (Gill and Johnson, 2010; Collis and Hussey, 2014). To ensure a high level of reliability of this study, researcher maintained the rigidity or robustness the research instruments, conducted pilot tests (Saunders et al., 2016), established audit trail and case study protocols (Robson McCartan, 2016; Yin, 2018), and calculated reliability test of the research instrument using Cronbach's alpha reliability coefficient (Creswell, 2012). Very importantly, a robust verification process was built at all stages of the study to strengthen reliability, For example, the study obtained verification of transcripts by the interviewees to enhance reliability of its findings (Miles, Huberman and Saldana, 2014).

3.11 Research ethical considerations

Researcher considers all the ethical issues throughout the entire process of the research. The main ethical considerations in this research include inter alia: obtaining informed consent of the research

participants; conveying assurance to the participants that their anonymity and confidentiality of the research data will be maintained and preserved, researcher maintaining objectivity and openness (Saunders et al., 2016), and adhering to the university's research ethical approval process. Ethical approval was obtained from the University's Ethics Approval Panel.

3.12 Summary of research methodology adopted

Table 3.31 outlines the research methodology adopted throughout the research process.

Table 3.31 Summary of research methodology adopted

Research element/layer	Adopted
Research philosophy	Pragmatism
Research purpose/type	Exploratory/evaluative/descriptive
Research approach	Abductive
Methodological choice	Mixed methods research
Research strategy	Case study/survey
Time Horizons	Cross sectional study
Research methods/techniques	Literature review, questionnaire, interviews and documentary analysis

3.13 Chapter summary

This chapter has discussed some key concepts of research methodology. It discusses the two main research methodology frameworks, namely the Nested Research Methodology framework introduced by Kagioglou et al. (1998) and the research 'onion' framework introduced by Saunders et al. (2016). This research adopts the research 'onion' designed by Saunders et al (2016) to guide and direct the adopted research methodology. The research 'onion' methodology framework illustrates how the study moves progressively from the broad research philosophy to the more specific research techniques and procedures in order to achieve its aim and objectives and answer the research questions. This chapter also discusses each element (e.g. research philosophy, research approach, research strategy, etc.) of the research 'onion' and provides the justification for their selection.

The pragmatic philosophy was adopted to achieve the research aims, questions and objectives because of its ability to use both quantitative and qualitative research designs and deals with the complex reality of PMM. In line with this, this study adopts the abductive approach because it

moves back and forth between the deductive and inductive approaches in development of theory and is strongly associated with the philosophical stance of this research, pragmatism.

The questionnaire was used for survey semi-structured interviews and document analysis were used for the case study as the data collection methods in this research. The questionnaire survey was used to provide the general understanding of practices of PMM in construction in the context of Saint Lucia, a developing countries, as well as to inform the main qualitative phase of the research. Semi-structured interviews supplemented by document analysis were used within the two case studies to further explore and provide an in-depth account of the PMM practices within the case firms. The literature review was used to establish the key variables or concepts of PMM and for development of the initial conceptual framework that can be used to measure and evaluate the performance of construction firms. The literature review was also used to contextualize the findings of this research.

The total population sampling was used in this research for the quantitative data collection, while purposive sampling was used in this research to establish the sample size for qualitative data collection, the methods of data analysis were discussed in this chapter. The quantitative data analysis for the questionnaire was conducted manually through Microsoft Excel, and through SPSS 23 software, while the qualitative data analysis will be performed using thematic analysis. The results of the analyses of the survey and two case studies data were used to refine the original proposed conceptual framework. Finally, five interviews of experts in construction industry were conducted to validate the refine CPMM framework. The outcome gave rise to the final CPMM conceptual framework.

Chapter 4 Quantitative analysis and findings

4.1 Introduction

This chapter presents the analysis and results of the questionnaire survey. The response rate, respondent profiles, the internal consistency reliability of the questionnaire survey, and analysis and findings for the each objective are presented in sections below. The results provide a general understanding of underlying characteristics of PMM within the Saint Lucian construction industry.

In this study, descriptive statistics were used to summarize and describe the individual variables in the quantitative data set and present them in tables, graphs and charts (Collis and Hussey, 2014, O'Leary, 2017). In contrast, inferential statistics were used to draw conclusions about the population from the data quantitative data set (Collis and Hussey, 2014, O'Leary, 2017). For example, they can be used to identify the relationships or association between the variables in the data set or to estimate the characteristics of the population. Under the inferential statistical methods in particular multivariate analysis, factor analysis (principal components analysis) was applied in this study to explore the correlation between pairs of variables in the quantitative data set and reduce the data set into composite variables or components.

4.2 Response rate

This study adopted a single (one for one) self-administrated questionnaire survey approach, in which the questionnaire together with a covering letter explaining the purpose of the survey were distributed to the target managers of 47 construction firms in Saint Lucia. Out of this amount, 34 managers responded to the questionnaire survey. All the responses were usable for and included in the data analysis of the study. This represents a complete (adjusted) response rate of 72.3 per cent, which is high for construction management research. Moreover, this response rate compares favourably with those obtained from surveys in similar construction management studies with sample sizes within 100, as shows table 4.1. This relatively high survey response rate may be due to the repeated follow-ups to receive completed questionnaires as well as to the interest of the respondents to the research area. This demonstrates satisfactory validity and reliability of the findings.

Table 4.1 Comparable survey studies and response rate

#	Author(s)	Research focus	Sample selected	Complete Response rate
1	Beatham (2003)	Aims to develop an integrated business improvement system	66	39.4%
2	Lo, Wong and Cheung (2006)	Aims to Use BSC approach to measure performance of partnering Projects	60	42%
3	Yu et al. (2007)	Aims to develop a PM System for construction companies	60	38%
4	Yeung , Chan and Chan (2008)	Aims to establish quantitative indicators for measuring the partnering performance of construction projects in Hong Kong	33	71%
5	Ali et al. (2013)	Aims to identify indicators for measuring performance of building construction companies in Kingdom of Saudi Arabia	67	35.8%

4.3 Demographics Profile of survey respondents

In this study, demographics of survey respondents were analyzed using basic descriptive statistics, namely frequency counts and percentages. Table 4.2 presents the demographics profile of the survey respondents in this study. The results from Table 4.2 indicate about 64.6 percent of respondents in the questionnaire survey possess at least a Bachelor's degree qualification or higher qualification (38.2 percent with Bachelor's degree, 14.7 percent with Master's degree, 8.8 percent with professional qualification such as ACCA and RICS, and 2.9 percent post graduate diploma). In terms of experience, the majority (67.6 per cent) of respondents have more than 20 years of work experience within the construction industry followed by 14.7 per cent who had from 16 to 20 years of work experience. Furthermore, the majority (41.2 per cent) of respondents have more than 20 years of work experience within their respective firms followed by 8.8 per cent who had from 16 to 20 years of work experience in their own firms. The results show that most (64.8 per cent) of respondents in the survey were employed at top executive level (CEOs, principals and managing directors) within their respective construction firms. Out of these top executives, about half were managing directors in their firms. The respondents' higher levels of educational attainment and extensive work experience demonstrate the satisfactory quality level of the collected responses and the high reliability level of the answers provided, and that they are likely to have a good understanding of their firms' internal and external environments.

In terms of location, the respondents came from different parts of the island of Saint Lucia in Castries, Gros Islet, Vieux Fort, Laborie and so on.

Table 4.2 Respondent profiles

Demographic variables	Categories	Frequency	Percentage
Education level	Master's Degree	5	14.7
	Professional certificate/qualification	3	8.8
	Postgraduate Diploma	1	2.9
	Bachelor's degree	13	38.2
	Diploma	9	26.5
	Other qualification	3	8.8
	Total	**34**	**100.0**
Working experience in the Industry	21 and over	23	67.6
	16 to 20	5	14.7
	11 to 15	1	2.9
	6 to 10	3	8.8
	5 and below	2	5.9
	Total	**34**	**100.0**
Working experience in the firm	21 and over	14	41.2
	16 to 20	3	8.8
	11 to 15	2	5.9
	6 to 10	7	20.6
	5 and below	8	23.5
	Total	**34**	**100.0**
Current position	General manager/Chief Executive Officer	4	11.8
	Principal	7	20.6
	Managing Director	11	32.4
	Construction manager	2	5.9
	Finance Manager	2	5.9
	Project manager	1	2.9
	Engineer/engineering manager	0	0
	Other manager	7	20.6
	Total	**34**	**100.0**

4.4 Reliability and descriptive statistics analysis

The data obtained from survey were analysed using Statistical Package for Social Science (SPSS) software package version 23 and Microsoft Excel, to provide internal consistency (as measured by the Cronbach's alpha (α) coefficient values) and the descriptive statistics for each variable in the research constructs used in this study. Descriptive statistics generate values for mean and standard deviation.

4.4.1 Internal reliability test

Internal reliability or consistency is important when using a multiple-item scales such as a questionnaire (Collis and Hussey, 2014). Kumar (2014) suggests that internal consistency occurs

when items or questions of a questionnaire survey that measure the same phenomenon e.g. PMM should produce the same results under the same or similar condition. Using SPSS version 23, reliability statistical test was ran in this study to determine the internal consistency (reliability) between the items or variables in the survey instrument (measurement scale). Moreover, the internal consistency reliability for the questionnaire survey was determined by calculating the Cronbach's Alpha coefficient (α). A Cronbach alpha coefficient that is greater than 0.7 for a construct or a group of constructs is considered as an acceptable internal reliability (Nunnally, 1978; Hair et al. 2014). Meanwhile, a Cronbach alpha that is above 0.6 for a construct or a group of constructs is satisfactory for an exploratory study such as this study (Nunnally, 1978, cited in Bahri, St-Pierre and Sakka, 2017; Hair et al. 2014). Generally, as the number of items increase in an instrument, its reliability tend to increase (Hair et al., 2014). Table 4.3 shows the summary of internal consistency of the questionnaire survey. Cronbach's alpha was 0.979 for the overall questionnaire survey, which indicates an excellent internal consistency for the entire questionnaire survey. All the constructs in the questionnaire reveal high reliability with the lowest Cronbach's alpha being 0.812 and highest being 0.927. This suggests that the questionnaire survey is acceptable and highly reliable. Furthermore, this high reliability is an indication of the high level of accuracy, consistency, stability and predictability of results obtained from the questionnaire survey (Gill and Johnson, 2010; Kumar, 2014).

Table 4.3 Reliability Statistics of the questionnaire survey

Construct		**Cronbach's alpha**	**Number of items**
perspectives	Financial	0.856	10
	Customer	0.892	8
	Internal business	0.919	13
	Learning & growth	0.931	13
	Supplier	0.914	6
	Project	0.842	7
	Environment & community	0.821	6
Use of performance measures	Measure performance	0.898	3
	Strategy management	0.922	7
	Communication	0.812	5
	Influence behaviour	0.913	6
	Learning & improvement	0.914	6
	Managing risks	0.918	4
Barriers to CPMM framework implementation	Internal	0.927	10
	External	0.864	6
Development of performance measures		0.924	3
Overall		**0.979**	**113**

4.4.2 Descriptive analysis

Using the descriptive analysis, the mean scores or values and the standard deviation of responses were calculated in this study. The mean scores for each variable were derived by adding together the actual mean scores of all responses in the sample and dividing this by the number of responses. The overall average mean score for the separate constructs or categories was derived by adding the mean scores of the associated variables within each construct and dividing by the number of variables in the construct. The mean scores of the variables within a construct are presented in a descending order of the most significant ones as indicated by the highest mean, and of the least significant ones used as indicated by the lowest mean among all variables.

The standard deviation value gives an indication of the respondents' level of consensus for the rating or ranking of each variable. In this survey, the standard deviation value of each variable was relatively small (below 1.50), which suggested the respondents' satisfactory consensus of its significance and that the mean scores are sufficiently reliable. Although standard deviation values that are less than one unit is a better indication of establishing a high consensus in the rating of the variables among the survey respondents (Koleoso, Omirin and Adewunmi, 2017). It should be noted that different researchers have used different criterion for the determination of a variable as significant using a 5 point rating scale, and then for inclusion of it in a proposed conceptual framework. For significant variables, some authors (Yuan et al., 2011) adopted a benchmark mean score of 3.00. Chileshe, Rameezdeen and Hosseini (2015) considered a mean score rating of 3.40 or above. Koleoso et al (2017) adopted a mean score rating of 3.50 or above. Kulatunga et al. (2011) and Zhou et al., (2013) set a cut-off point mean score of 4.00. In this study, a mean score of 3.50 was set as the cut-off point to reflect a variable as being significant.

The survey results of the study are presented under each of following research objectives.

4.4.2.1 Objective 2: performances measures used and their uses

4.4.2.1.1 Results based on the overall ranking of perspectives

Table 4.4 shows that overall mean score for all the performance measures from all the performance perspectives is 3.74. Overall, the survey findings reveal that PMM is important to Saint Lucian

construction firms. This implies that performance measures are widely utilised within construction firms in Saint Lucia. The overall mean score for all the measures within the non-financial performance perspectives is 3.75, whereas the overall mean score for the financial perspective is 3.71. This suggests that Saint Lucian construction firms are using non-financial performance measures more extensively than financial measures, which is consistent with the some of the empirical findings in the literature (e.g. Upadhaya et al. 2014).

Overall, all the perspectives recorded average mean scores above 3.00, suggesting that they are all important to the Saint Lucian construction firms in assess their performance. Project perspective yielded the highest average mean score of 4.20, followed by environment and community perspective with an average mean score of 3.93 and customer perspective with an average mean score of 3.71. The high extensive usage of project performance measures may reflect the project-based characteristics of construction firms and the industry as whole in Saint Lucia. Internal business process perspective was the lowest ranked performance perspective with an average mean score of 3.45.

Table 4.4 Overall performance perspectives

Perspective	**Mean**	**Standard deviation**	**Ranking Perspective**
Project perspective	4.20	0.62	1
Environmental & community perspective	3.93	0.85	2
Customer perspective	3.71	0.65	3
Supplier	3.69	0.66	4
Learning and growth	3.53	0.75	5
Internal business process perspective	3.45	0.60	6
Overall non-financial perspectives	**3.75**	**0.68**	**1**
Financial perspective	3.71	0.63	2
Overall financial and non-financial perspectives	**3.74**		

4.4.2.1.2 Results based on ranking of performance measures

Appendix I, Figure 4.1 and Tables 4.5 to 4.11 present the mean scores of the performance measures in this study. Appendix I shows the mean scores of the individual 63 performance measures used in this study. Figure 4.1 shows all the top ranked performance measures used in Saint Lucian construction firms with mean values of 4.00 or higher. Meanwhile tables 4.5 to 4.11show the mean

scores, standard deviation values and ranking of the various performance measures within each of the seven performance perspectives.

The survey results reveal that the mean score of the 63 of performance measures (see appendix I) used by Saint Lucian construction firms was higher than the midpoint score (3.00) of the Likert scale. Furthermore, the overall mean value of the BSC is about 3.74, reflecting a reasonable level of its effectiveness. The survey findings evince that Saint Lucian construction firms may be using a range of performance measures to assess their performance.

The survey results in both Figure 4.1 and tables 4.5 to 4.11 indicate that Saint Lucian construction firms rely extensively on both financial and non-financial measures within the seven BSC perspectives to assess their performance. Moreover, the survey results in figure 4.1 indicate that 15 performance measures with mean values of 4.00 or higher were most highly ranked by respondents. Furthermore, the survey results in **Appendix I** shows that 44 performance measures recorded mean values of 3.50 or higher. Of 44 performance measures, 6 belong to financial perspective, 5 belong to customer perspective, 6 belong to internal business process perspective, 9 belong the learning and growth perspective, 5 belong to supplier perspective, 7 to project perspective and 6 to environment and community perspective. Generally, this shows that Saint Lucian construction firms may be focusing on applying a reasonable balance between financial and non-financial measures as well as among all seven perspectives to achieve their objectives.

The findings in **figure 4.1** show that the respondents ranked quality of workmanship and product (mean 4.56), a non-financial performance measure classified under the project perspective, as the highest extensively used performance measure by Saint Lucian construction firms. This result implies that the successful performance of Saint Lucian construction firms tends to depend on measuring and monitoring closely the quality of workmanship and final products of projects. Other highly rated non-financial performance measures by respondents include customer satisfaction (mean 4.50) within customer perspective; response time to business issues (mean 4.47) within internal business process; and client satisfaction rating of projects (mean 4.26) and time of delivery against agreed standards or targets (mean 4.26) classified under the project perspective.

The survey findings in figure 4.1 show that cash flow level (mean 4.50), a financial measure, was ranked by the respondents as the second highest intensely used performance measure by Saint Lucian construction firms. Net profit margin was other financial performance measure that ranked fifth by survey respondents.

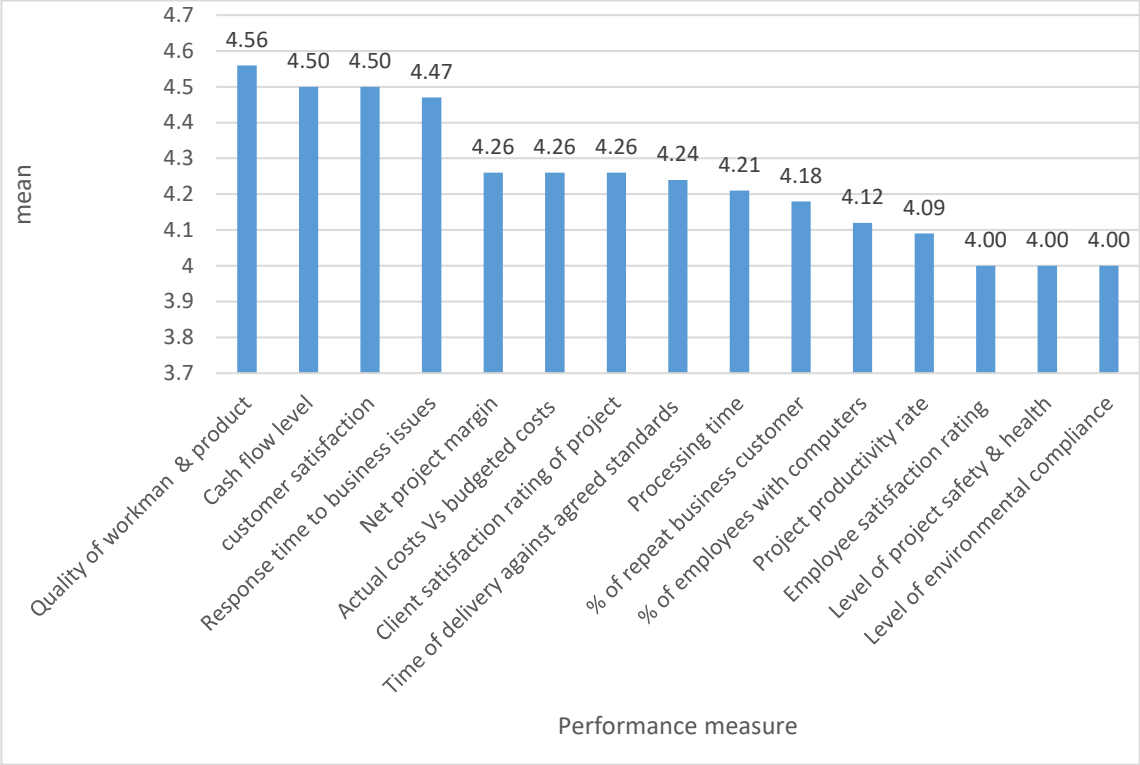


Figure 4.1: Performance measures used in construction firms in Saint Lucia

4.4.2.1.3 Performance measures within the financial perspective

It is observable from table 4.5 that cash flow level (mean 4.50) under the financial perspective was the most extensively used financial performance measure within construction firms. This is an important liquidity measure used by firms to ensure their survival in the market and therefore needs to be monitored closely. This was followed by profit or net profit margin (mean 4.26), an important measure their profitability and receivables (mean 3.91), a liquidity measure. This may imply that Saint Lucian construction firms understand the importance of generating net profits to increase their net worth or value. Moreover, this may imply that Saint Lucian construction firms are also

paying close attention to receivables since generally the construction industry tend to witness high levels of receivables due to late payments. In the same vein, high levels of receivables can have a negative effect on cash flow of Saint Lucian construction firms and hence on the ability to meet their short-term financial obligations. Furthermore, these findings also show that Saint Lucian construction firms are more concerned with cash flows rather than profits.

The survey respondents also ranked level of debt as an important measure to assess financial performance of Saint Lucian construction firms. This finding is not surprising as high indebtedness will increase the financial risk of Saint Lucian construction firms and may adversely affect their survival and future development. Therefore, they need to monitor debt levels to ensure that their debts are within sustainable level. Meanwhile, the two least ranked financial performance measures were interest coverage ratio (financial stability measure) and current ratio (a liquidity measure). These results imply that Saint Lucian construction firms may have been placing more emphasis on other important financial stability and liquidity measures.

Table 4.5 Financial performance measures used by Saint Lucian construction firms

	Perspective		**Mean**	**Standard deviation**	**Ranking Perspective**
1	**Financial perspective**		3.71	0.62	3
	CSF	**Measure**			
1	Liquidity	Cash flow level	**4.50**	**0.12**	**1**
2	Profitability	Profit or Net profit margin	**4.26**	**0.44**	**2**
3	Liquidity	Receivables turnover (days)	**3.91**	**0.83**	**3**
4	Stability	Level of debt (indebtedness)	**3.88**	**0.55**	**4**
5	Profitability	Return on Investment	**3.74**	**0.47**	**5**
6	Growth	Net sales (turnover) growth rate	**3.56**	**0.93**	**6**
7	Growth	Net profit growth rate	**3.44**	**0.80**	**7**
8	Stability	Debt ratio	**3.41**	**0.72**	**8**
9	Liquidity	Current ratio	**3.35**	**1.14**	**9**
10	Stability	Interest coverage ratio	**3.03**	**0.17**	**10**

4.4.2.1.4 Measures in the non-financial perspectives – customer perspective

As shown in Table 4.6, the three most highly rated performance measures classified under the customer perspective were customer satisfaction rating (mean 4.50), percentage of repeat business customers (mean 4.18) and organizational (corporate) image rating (3.91). These results suggest that Saint Lucian construction firms appear to be measuring and closely monitoring their customer

satisfaction performance and repeat business customers. Equally important to Saint Lucian construction firms is tracking of their corporate image in the eyes of their customers and other stakeholders in the marketplace to drive performance.

Customer growth and number of new customers are also two important measures used the customer performance of Saint Lucian construction firms. In addition to focusing on existing customers, Saint Lucian construction firms may be also focusing on acquisition of new customers. The outcomes of these measures may encourage future actions such as marketing efforts towards their organizational growth.

Moreover, survey respondents rated percent of market share as the least widely used customer performance measure of Saint Lucian construction firms. This may be due to the difficulty in obtaining the data to calculate this measure.

Table 4.6 Customer performance measures used by Saint Lucian construction firms

	Perspective		**Mean**	**Standard deviation**	**Ranking Perspective**
2	**Customer perspective**		3.71	0.65	4
	CSF	**Measure**			
1	Customer satisfaction	Customer satisfaction rating	**4.50**	**0.81**	**1**
2	Return on customer relationships	% of repeat business customers	**4.18**	**0.74**	**2**
3	Return on customer relationships	Organization (corporate) image rating	**3.91**	**0.28**	**3**
4	Customer acquisition	Customer or client growth	**3.62**	**0.03**	**4**
5	Customer acquisition	Number of new customers	**3.59**	**0.84**	**5**
6	Customer acquisition	Number of customer improvement suggestions	**3.32**	**0.53**	**6**
7	Customer satisfaction	Number of complaints from customers	**3.29**	**1.25**	**7**
8	Return on customer relationships	% of market share	**3.24**	**0.28**	**8**

4.4.2.1.5 Measures in the non-financial perspectives – internal business process

Table 4.7 shows the results of the performance measures within the internal business process perspective. Survey respondents ranked response time to key quality and/or other business issues, processing time and level of defeats as the top performance measures used by Saint Lucian construction firms to assess their internal business process performance. This implies that Saint

Lucian construction firms have been paying high attention to time and quality aspects within their internal business processes to measure and improvement their performance.

On the other hand, the lowest ranked performance measure in terms of the extent of usage by Saint Lucian construction firms was risk scores for core construction business activities (mean 2.53). Other low ranked performance measures under this perspective include time loss to accidents and accident rate/level. This may suggest that Saint Lucian construction firms have been placing less emphasis on performance measures associated with safety and risk management factors.

Table 4.7 Internal business process measures used by St. Lucian construction firms

	Perspective		**Mean**	**Standard deviation**	**Ranking Perspective**
3	**Internal business process perspective**		3.45	0.60	7
	CSF	**Measure**			
1	Quality of service	Response time to key quality and/or other business issues	**4.47**	**0.12**	**1**
2	Process management	Processing time	**4.21**	**0.36**	**2**
3	Quality of service	Level of defects or errors	**3.71**	**0.52**	**3**
4	Process management	Construction productivity rate	**3.71**	**0.82**	**4**
5	Process management	% of expenses to total sales (turnover)	**3.62**	**0.80**	**5**
6	Process management	Successful tenders rate	**3.56**	**0.68**	**6**
7	Risk management	Risk management responses	**3.47**	**0.27**	**7**
8	Risk management	No. of risk management meetings	**3.41**	**0.54**	**8**
9	Safety	Safety & health audit	**3.26**	**0.99**	**9**
10	Risk management	Risk assessment review	**3.24**	**0.97**	**10**
11	Safety	Accident rate/level	**3.00**	**0.64**	**11**
12	Safety	Time loss to accidents	**2.68**	**0.37**	**12**
13	Risk management	Risk scores for core construction business activities	**2.53**	**0.72**	**13**

4.4.2.1.6 Measures in the non-financial perspectives – Learning and growth

Table 4.8 depicts the results of performance measures under learning and growth perspective of the surveyed construction firms in Saint Lucia. The respondents' ranked percentage of employees using computers in construction, employee satisfaction rating and competency coverage ratio as the most extensively used measures by Saint Lucian construction firms for assessing their learning and growth performance. This implies that Saint Lucian construction firms have been paying extensive attention in ensuring that appropriate employees are using computers to generate the necessary information for their purposes. These findings may indicate that Saint Lucian construction firms might be exploring the use of this measure to influence and increase level of

computer and ICT literacy and IT/ICT applications within them. In contrast, these are interesting as there is no evidence in the literature to suggest that construction firms are extensively using percentage of employees with computers as a critical performance measure.

In addition, the survey results show that Saint Lucian construction firms are playing particular attention to the level of employee satisfaction in the assessment of their learning and growth performance. This implies that Saint Lucian construction firms have been relying on evaluating and improving their employee satisfaction to secure performance improvement and growth.

Furthermore, Saint Lucian construction firms may have been monitoring their competency coverage ratio in order to identify and focus attention on the critical competencies of employees required in meeting their current and anticipated business needs. The result of this important performance measure can enable Saint Lucian construction firms to identify their competency gaps between current and required levels of competencies for strategy execution.

Conversely, the survey results show that the percentage of employees with degrees and investment in leadership development were the least used learning and growth measure among Saint Lucian construction firms. This may imply that Saint Lucian construction firms have been focusing on deploying employees with the required competency level rather than those with high educational achievement such as degrees. This further implies that Saint Lucian construction firms are paying little attention to investing in training and education programme to support leadership development.

Table 4.8 Learning & growth used by St. Lucian construction firms

	Perspective		Mean	Standard deviation	Ranking Perspective
4	**Learning & growth perspective**		3.53	0.75	6
	CSF	**Measure**			
1	Technology competency	% of employees using computers in construction	**4.12**	**0.90**	**1**
2	Employees	Employee satisfaction rating	**4.00**	**0**	**2**
3	Organizational Competency	Competency coverage ratio	**3.82**	**0.95**	**3**
4	Technology competency	Level of IT application in construction	**3.76**	**0.60**	**4**
5	Employees	Recognizing & rewarding employee for outstanding performance	**3.71**	**0.92**	**5**
6	Employees	Employee productivity rate	**3.59**	**0.72**	**6**
7		Investment in IT in construction	**3.59**	**0.55**	**7**
8	Employees	Employee absenteeism rate	**3.53**	**0.74**	**8**
9	Employees	# of employee improvement suggestions	**3.53**	**1.02**	**9**
10	Organizational Competency	Investment in Knowledge management efforts	**3.26**	**0.72**	**10**
11	Employees	Training hours per employee per year	**3.15**	**0.90**	**11**
12	Technology competency	Investment in leadership development	**3.09**	**0.52**	**12**
13	Employees	% of employee with degrees	**2.76**	**1.24**	**13**

4.4.2.1.7 Measures of non-financial perspectives - supplier

The results in table 4.9 shows that the level of supplier's defect free deliveries and the percentage of on-time supplier deliveries were the most extensively used performance measures within the Saint Lucian construction firms to assess their supplier performance. These results are not surprising as Saint Lucian construction firms will want to receive materials from suppliers on time and without defects. The outcomes of these two measures will reflect on the achievement of timely delivery of good quality materials prior to undertaking construction or a process. In addition, the survey respondents also ranked the level of supplier satisfaction high. This implies that a high perceived level of supplier satisfaction would reflect that Saint Lucia construction firms are making timely payment to their suppliers, maintaining mutually beneficial relationship with suppliers with their suppliers and have encountered little amount of disputes with suppliers.

Conversely, the lowest ranked supplier performance measure was the number of innovative suggestions from suppliers. This imply construction firms are placing less emphasis on monitoring innovative suggestions from suppliers, which are perceived as contributing towards organizational growth.

Table 4.9 Supplier performance measures by St. Lucian construction firms

#			Mean	Standard deviation	Ranking Perspective	Ranking Overall
5	**Supplier perspective**		3.69	0.66	5	
	CSF	**Measure**				
1	Supplier management	Level of supplier's defect-free deliveries	**3.94**	**0.73**	**1**	
2	Supplier management	Percentage of on-time supplier deliveries	**3.91**	**0.56**	**2**	
3	Supplier management	Level of supplier satisfaction	**3.76**	**0.49**	**3**	
4	Supplier management	Level of flexibility	**3.71**	**0.53**	**4**	
5	Supplier management	Supplier lead time against industry norm	**3.59**	**0.55**	**5**	
6	Supplier management	Number of innovative suggestions from suppliers	**3.21**	**1.09**	**6**	

4.4.2.1.8 Measures in the non-financial perspectives - Project

As shown in the Table 4.10 below, all the performance measures classified under the project perspective were highly rated except for one measure, project profit margin that ranked below mean score of 4.00. The five top ranked performance measures within the project perspective were quality of workmanship and product, actual costs versus budgeted costs, time of delivery against agreed standards or targets, client satisfaction rating and project productivity rate. These survey results show that the Saint Lucia construction firms are moving beyond the traditional (iron triangle) measures of project performance of cost, time and quality to consider other measures such client satisfaction and productivity in order to deliver excellence in project management and performance.

Table 4.10 Project performance measures used by St. Lucian construction firms

	Perspective		Mean	Standard deviation	Ranking Perspective
	Project perspective		4.20	0.62	1
	CSF	**Measure**			
1	Project management	Quality of workmanship and product	**4.56**	**0.43**	**1**
2	Project management	Actual costs vs Budgeted costs	**4.26**	**0.61**	**2**
3	Project management	Client satisfaction rating	**4.26**	**0.66**	**3**
4	Project management	Time of delivery against agreed standards	**4.24**	**0.48**	**4**
5	Project management	Project productivity rate	**4.09**	**0.67**	**5**
6	Project management	Level of project safety	**4.00**	**0.54**	**6**
7	Project management	Project profit margin	**3.97**	**0.96**	**7**

4.4.2.1.9 Measures of non-financial perspectives – Environment and community

According to the survey results in table 4.11, the three most highly rated performance measures within the environment and community (Evn. and com) perspective by respondents were level of environmental compliance, energy consumption and number of jobs created. These results emphasize that Saint Lucian construction firms are focus their attention on comply with environmental laws and regulations. The high prominence given to environmental compliance may reflect that the Saint Lucian society has become more aware of environmental and other sustainability issues and of need for construction firms to change their practices and behaviour toward the successful achievement of environmental sustainability in the construction industry.

Although respondents ranked wastage and scrap level and water consumption as the least used measure with this category, they still considered these measures as important for environmental performance of Saint Lucian construction firms.

Table 4.11 Env. & com. performance measures used by St. Lucian construction firms

	Perspective		Mean	Standard deviation	Ranking Perspective
	Environment & community perspective (7)		3.93	0.85	2
	CSF	**Measure**			
1	Sustainability	Level of environmental compliance	**4.00**	**0.73**	**1**
2	Sustainability	Energy consumption	**3.94**	**0.81**	**2**
3	Sustainability	Number of jobs created	**3.94**	**0.97**	**3**
4	Sustainability	Contribution to the local community	**3.94**	**0.91**	**4**
5	Sustainability	Water consumption	**3.88**	**0.78**	**5**
6	Sustainability	wastage and scrap rate/level	**3.88**	**0.92**	**6**

4.4.2.1.10 Uses of performance measures in Saint Lucian construction firms

Survey respondents were asked to indicate the extent to which performance measures are being used in their firms. Figure 4.2 and Table 4.12 represent the results of the use of performance measures by Saint Lucian construction firms. Figure 4.2 shows the top eleven significant uses of the performance measures by the Saint Lucian construction firms, while table 4.12 shows the mean scores, standard deviation (SD) and ranking of the 31 uses of performance measures classified into the six usage categories.

As shown in figure 4.2 , the four top ranked uses of performance measures by Saint Lucian construction firms are as follows: compliance with regulations (mean 4.26), monitoring progress towards achieving objectives (mean 4.24), internal communication to management and employees at all levels (mean 4.24) and evaluating performance (mean 4.21). These findings are not surprising as compliance, communications, and monitoring progress and control are typically important aspects of construction firms. Saint Lucian construction firms seem to focus on complying with inter alia the following regulations: building regulations and codes of practice, safety regulations, financial reporting regulations, and employment regulations and the Saint Lucia's labour code.

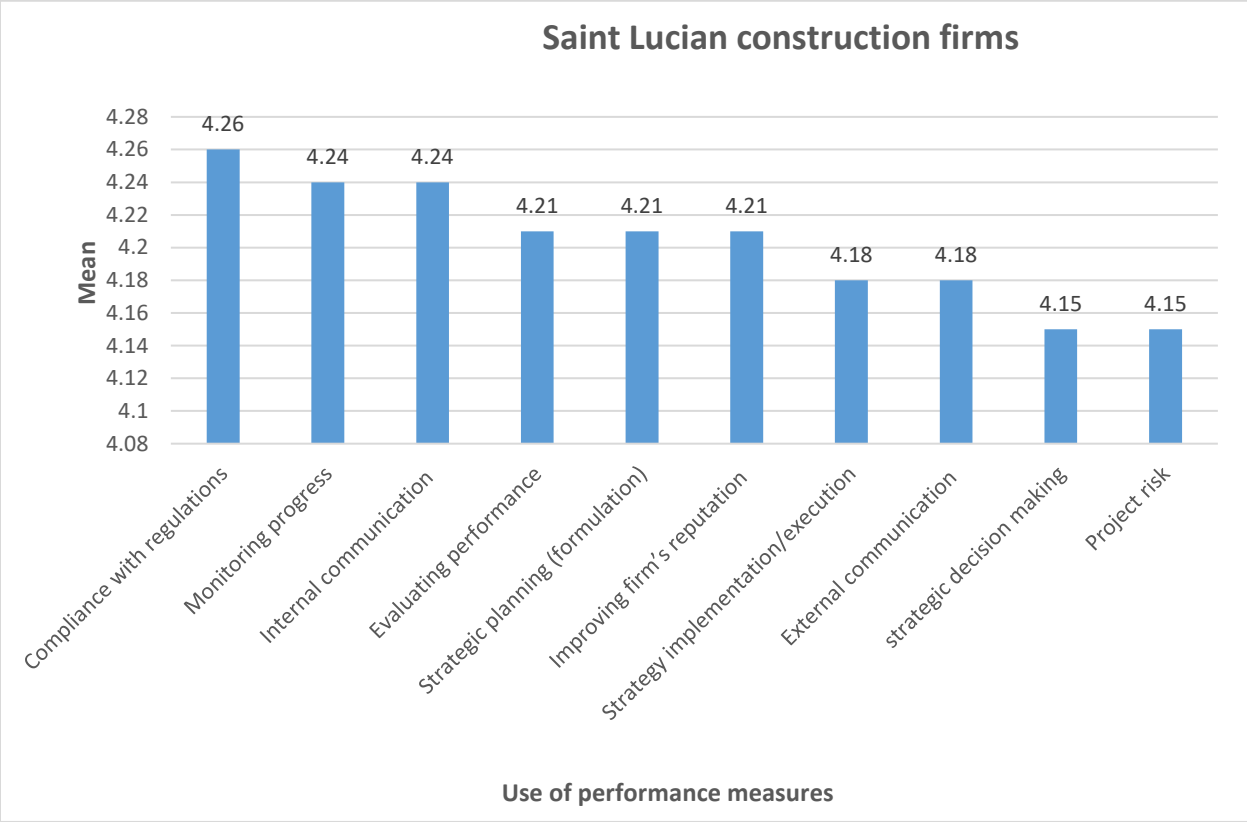


Figure 4.2: Uses of performance measures by Saint Lucian construction firms

Furthermore, the survey results in table 4.12 indicated 28 of the uses performance measures yielded mean scores of 3.50 or higher. This reflects that Saint Lucian construction firms are utilising performance measures for a wide range of purposes, which may contribute towards their PMM framework effectiveness.

The survey results in table 4.12 indicate that the respondents rated, on over, the categories of usage of performance measures in descending order as follows: measure performance (mean 4.18) strategy management (mean 4.06), managing risks (mean 3.98), communication (mean 3.85), influence behaviour, (mean 3.83) learning and improvement (mean 3.82). This implies that Saint Lucian construction firms are placing more emphasis on 'measure performance' usage category rather than other usage categories. Generally, measuring performance of construction firms is often considered as the basic and traditional use of performance measures.

Regarding to other performance measure uses, the survey results also show that Saint Lucian construction firms are also managing their performance through strategy management role of performance measures. Within the strategy management use category, the respondents perceived strategic planning, strategy implementation, focus attention, and strategic decision-making as being important uses of performance measures.

Within the managing risk use category, the survey respondents ranked project risk (mean 4.12) and financial risk (mean 4.09) as the most significant uses of measures by Saint Lucian construction firms. Like in other countries, these results may be due the project-based nature of construction firms in Saint Lucia. The outcome of these uses will contribute towards the successfully achievement of their project objectives and hence success.

Conversely, the least significant use of performance measures by Saint Lucia construction firms as perceived by the respondents include communication between head office and divisions, benchmarking with other firms and/or between business units, enhancing benchmarking practices and monitoring behaviour via performance appraisal/targets. Despite this increasing amount of studies articulating the importance of benchmarking and benchmarking of best practices, construction firms in Saint Lucia are paying little attention to use of benchmarking for performance evaluation.

Table 4.12 Use of performance measures by St. Lucian construction firms

#	Uses of measures	Mean	STD	Ranking
	Measure performance	**4.18**	**0.911**	
1	Monitoring progress towards achieving objectives	4.24	0.955	2
2	Evaluating performance	4.21	0.978	4
3	Learning existing work practices	4.12	1.066	11
	Strategy management	**4.06**	**0.639**	
1	Strategic planning (formulation)	4.21	0.808	5
2	Strategy implementation/execution	4.18	0.797	7
3	Focusing attention on strategic aspects of business	4.09	0.753	13
4	strategic decision making	4.15	0.702	9
5	Strategic capabilities	3.97	0.758	16
6	Managing strategic change	3.97	0.797	17
7	Challenging strategic assumptions	3.82	0.797	22
	Communication	**3.85**	**0.876**	
1	Internal communication to management & employees at all levels	4.24	0.978	3
2	External communication to other stakeholders	4.18	1.141	8
3	Communicating benchmarking	3.47	1.187	29
4	Compliance with regulations	4.26	0.790	1
5	Communication between head office and divisions	3.15	1.560	31
	Influence behaviour	**3.83**	**0.778**	
1	Monitoring behaviour via performance appraisal /targets	3.65	1.098	27
2	Motivation of organizational members	3.76	0.955	24
3	Role understanding	3.85	0.925	20
4	Cooperation and coordination	4.09	0.900	14
5	Rewarding or compensating behaviour	3.71	0.760	26
6	Managing relationships	3.94	0.919	19
	Learning and improvement	**3.82**	**0.839**	
1	Performance feedback information	3.74	0.994	25
2	double loop (high level) learning	3.62	1.116	28
3	Performance improvement	3.97	0.969	18
4	Improving firm's reputation	4.21	0.914	6
5	Enhancing accountability	4.00	0.888	15
6	Benchmarking practices	3.38	1.074	30
	Managing risks	**3.98**	**0.930**	
1	Strategic risk	3.82	1.086	23
2	Operational risk	3.85	0.925	21
3	Financial risk	4.12	1.066	12
4	Project risk	4.15	1.048	10

4.4.2.2 Objective 3: Developing performance measures

Survey respondents were required to indicate the sources that Saint Lucian construction firms used to develop performance measures. Table 4.13 shows the results and indicates that strategy and policy development with a mean score of 3.71 is the most important source that Saint Lucian construction firms have been using to develop their performance measures. This was followed by CSFs and existing PMM frameworks. One respondent indicated that performance measures were mainly derived from the firm's performance evaluation and review process, while another respondent suggested that performance measures are being derived from the industry standards.

Table 4.13 Development of performance measures

#	**Development of performance measures**	Mean	Standard deviation	Ranking Perspective
1	Strategy and policy development	**3.71**	**1.001**	**1**
2	CSFs	**3.53**	**0.860**	**2**
3	Existing PMM frameworks	**3.50**	**0.826**	**3**
	Overall	**3.59**	**0.837**	

4.4.2.3 Objective 4: Types of PMM frameworks used by St. Lucian construction firms

Respondents were asked to indicate the PMM framework(s) that is adopted in their firms to assess business performance. Table 4.13 shows the results of types of PMM frameworks that have been applied in Saint Lucian construction firms. It should be noted that the sum of responses does not equal to 34 since one firm can apply more than one PMM framework.

The survey results indicate that most of the respondents (43.6 percent) suggested that their firms have been using their own KPI framework to assess business performance. Additionally, the survey results also reveal that 35.9 percent of Saint Lucian construction firms adopt construction industry-based KPIs as their primary PMM framework. This may reflect that Saint Lucia was a colony of Britain up to 1979 and was still strongly influence by the Britain during the post-colonial period between 1980 and 2000. Accordingly, management practices for construction such as construction industry-based KPIs that were developed in the Britain during periods were also adopted in the Saint Lucian construction industry, which were then, modified to the Saint Lucian context.

According to the survey results, the BSC was adopted by 10.3% of Saint Lucian construction firms. The can imply that the knowledge and adoption of PMM frameworks other than KPIs are low among the Saint Lucian construction firms.

Regarding other frameworks, one firm suggested that it applies a project-specific framework to evaluate its performance. These survey results suggest that Saint Lucia construction firms have unanimously applied in their own KPIs developed from both the construction industry KPIs and their other perspectives.

Furthermore, none of the respondents suggested that their construction firms have been using the performance prism and performance pyramid.

Table 4.14 PMM frameworks being used Saint Lucian construction firms

#	**PM/PMM framework**	Responses	% of usage	Ranking
1	Balanced Scorecard	4	10.3	3
2	Construction industry KPs	14	35.9	2
	European Foundation of Quality Management (EFQM) model	1	2.6	5
	Performance prism	0	0	
	Performance pyramid	0	0	
	Results and determinant Framework	2	5.2	4
3	Firm's own developed KPIs	17	43.6	1
	Other PM frameworks	1	2.6	5
	Overall Total	**39**	**100**	

4.4.2.4 Objective 5: Barriers to CPMM implementation

The last part of the questionnaire listed 16 barriers (10 internal organizational barriers and 6 external barriers) that organizations may face in CPMM framework implementation, which were identified from the literature. The survey respondents were asked to express their opinions on the list of barriers to the successful implementation of a CPMM framework within their firms. Table 4.15 presents the results of the CPMM framework implementation barriers.

Overall, the respondents perceived that the internal barriers (3.47) have a slightly higher adverse influence on the successful implementation of CPMM framework than the external barriers (3.46). This can imply that respondents are placing more or less equal emphasis on them. Moreover, the results shows that economic downturn and uncertainties (mean 4.21), higher implementation costs (mean 3.82), and political uncertainties (mean 3.71) were perceived by respondents to be the three most significant barriers to CPMM framework implementation. The survey results also point out that there is a greater tendency for Saint Lucia construction firms in Saint Lucia to be completely averse about the adoption of any new management approaches, in particular a CPMM framework, in an uncertain economic environment.

The three most significant internal barriers to the implementation of a CPMM framework within Saint Lucian construction firms include higher implementation costs, inadequate resources for CPMM framework implementation and lack of knowledge of the concept of PMM.

Conversely, construction managers perceived economic downturn and uncertainties, and political uncertainties in the industry as the two most significant external (environmental) barriers inhibiting CPMM framework implementation within Saint Lucian construction firms. This may imply that Saint Lucian construction firms would normally postpone new development initiatives in period of economic uncertainty. Furthermore, the political uncertainty was perceived as a significant barrier that impedes the adoption of a CPMM framework within Saint Lucian construction firms. The recent changed in government in Saint Lucia (on June 6, 2016) could motivate the political uncertainty in the construction industry.

Meanwhile, the least ranked barrier to the implementation of a CPMM framework was low level of competition (mean 3.09). This may suggest that a low level of competition may, to some extent, act as barrier to the successful implementation of PMM framework within the firms. Therefore, a high level of competition may trigger Saint Lucian construction firms to revise their PMM frameworks and strategies to reflect changes in the competitive environment.

Table 4.15 CPMM framework implementation barriers

Barriers (Obstacles) to the implementation of a CPMMF	Mean	SD	Ranking
Internal factors/barriers	**3.47**	**1.17**	
High implementation costs	3.82	1.08	1
Inadequate resources for CPMMF implementation	3.68	1.03	2
Lack of knowledge and understanding of the concept of PMM	3.53	1.06	3
Inadequacy of appropriate IT infrastructure support	3.50	1.10	4
Lack of employees' involvement & participation	3.47	1.26	5
Lack of clear strategies and/or strategic alignment	3.41	1.21	6
Business/firm size	3.38	1.13	7
Lack of understanding of the expected benefits from CPMMF	3.38	1.15	8
Lack of top management support	3.26	1.42	9
Inappropriate organizational culture	3.29	1.27	10
External factors/barriers	**3.46**	**1.18**	
Economic downturn/uncertainties	4.18	1.08	1
Political uncertainty	3.68	1.25	2
Legislation & regulation in the industry	3.32	1.18	3
Reluctance to adopting new technologies	3.24	1.35	4
Social & ecological uncertainties	3.18	1.10	5
Low level of competition	3.09	1.24	6

4.5 Factor analysis

4.5.1 Introduction

This study runs factor analysis using principal component analysis (PCA) extraction method with Varimax rotation to reduce the data sets into distinctive components or factors for performance measures in use, the use of performance measures and the barriers to successful CPMM framework implementation within the Saint Lucian construction firms. In so doing, this study follows a three-step procedure to undertake the factor analysis, namely preliminary analysis, factor extraction and rotation, and component interpretation. They are now discussed below.

4.5.1.1 Preliminary analysis

Preliminary analysis produces is a correlation matrix of all of the identified variables and other related statistics. This correlation matrix displays the relationships between all the variables

underlying the factor analysis (Field 2009). It produces two statistic tests, namely the Bartlett's test of sphericity and a Kaiser-Meyer-Olkin (KMO) to determine appropriateness of the variables for factor analysis. Bartlett's test of sphericity determines if the population correlation matrix resembles to or is an identity matrix (Field, 2009, p.648). According to Field (2009, p.648), the Bartlett's test determines whether the population correlation matrix is significantly different from an identity matrix. Therefore, if it is significant then it implies that the correlations between variables are (overall) significantly different from zero. In the same vein, Bartlett's test of sphericity is significant at $p < 0.05$; signifying sufficient correlations exist among the variables to proceed with the factor analysis (Hair et al., 2014). The next test undertaken was the KMO test which measures the sampling adequacy for the execution of factor analysis (Field, 2009). The KMO statistic varies between 0 and 1.0 (Field, 2009). Furthermore, a KMO value greater than 0.50 is acceptable for the factor analysis to proceed (Hinton, McMurray and Brownlow, 2014).

4.5.1.2 Factor analysis and rotation

For factor extraction and rotation, this study uses principal Component Analysis (PCA) with a Varimax rotation of orthogonal rotation. An eigenvalue was calculated for each proposed component (factor) to provide a measure of the amount of variance that can be explained by each proposed factor (Hinton et al., 2014). A component (factor) with an eigenvalue of 1.0 or greater is considered important or significant (Hinton et al, 2014). Typically, the first component (factor) accounts for the largest proportion of total variance explained. Meanwhile, the scree plot of the factors provides graphical information on the eigenvalues and the component number. The PCA performs a rotation to obtain a clear and simple picture of which identified variables contributing to or loading on to each component (factor) and help interpret what the components (factors) represent (Hinton et al., 2014). In so doing, it produces the rotated component matrix, which displays the factor loadings for each variable onto each component (factor).

4.5.1.3 Component (factor) interpretation

Component interpretation involves an evaluation of the significance of relevant components (factors) extracted. In this study, the rotated loadings from the rotated components matrix are used in factor interpretation. Moreover, this study identifies the variables for each component and assesses the practical significance of factor loadings of the variables of each component or factor.

According to Hair et al. (2014, p.115), factor loadings in the range of ±0.30 to ±0.40 are considered to meet the minimal level for interpretation of structure, and loadings ±.50 or greater are considered practically significant. This study retains component with two or more variables, if each variable has a component (factor) loading value of 0.50 as the cut-off point. Furthermore, the study retains a component with one variable if it has a significant component loading of 0.60 or greater. It should be noted that the rotated component matrix for each theme displays the factor loadings with absolute values from 0.50 or greater.

Furthermore, communalities after extraction are produced for each variable. According to Field (2009), communality is "the proportion of common variance present in a variable" (p.637). It is important to assess the communalities of the variable after identifying all the significant loadings. The study retains all variables with communalities of 0.50 or greater as meeting the acceptable levels of explanation of variance (Hair et al., 2014). Finally, the study assigns a meaningful name or label to each component or (factor).

4.5.2 PCA results of performance measures used

As previously mentioned, the study excludes performance measures used in the questionnaire survey with a mean score of less than 3.50 from further analysis as they were considered insignificant to inform the development of the conceptual framework. Several studies has adopted this approach, notably Kulatunga et al. (2011). Consequently, the study performs factor analysis with PCA on 44 out of the 63 identified performance measures used in the questionnaire survey in order to reduce them into smaller sets of manageable components (factors) or groupings. Further, the study performs PCA to establish whether the 44 performance measures could be grouped in accordance with the seven BSC perspectives of the initial BSC conceptual framework.

The first factor analysis test using PCA was conducted and the test results show that 10 components (factors) were generated, which accounted for 81.81 percent of total variance explained of the 44 variables (performance measures). **Table 4.17** shows that all the performance measures have communality extraction values greater 0.50, which are acceptable. However, PCA would not generate the test results of Bartlett's test of sphericity and KMO (Kaiser-Meyer-Olkin). Accordingly, the resultant correlation matrix was visually assessed to identify the patterns of the

inter-correlations among the variables. Variables with consistently poor or low (e.g. below 0.30) correlations were deleted from the analysis. The factor analysis was rerun several times until the Bartlett's and KMO tests produced positive results and therefore confirming that the suitability of data for analysis.

The final factor analysis after rotation converged in seven iteration resulted in Bartlett's test of sphericity (df = 253) of 953.234 and significance value of 0.000 (less than 0.05), indicating that the population correlation matrix was not an identity (or nonzero) matrix. KMO measure of sampling adequacy was equal to 0.585, which is greater than the recommended threshold of 0.50. In summary, the KMO and Bartlett's test results showed that the data were suitable for factor analysis. **Table 4.16** summarizes the final test results of Bartlett's test of sphericity and KMO for performance measures used.

Based on the benchmark of component loadings at 0.50 or above for components with two or more variables and at 0.60 for components with only one variable, 30 performance measures used were retained. Therefore, 13 items were deleted from the analysis after several runs of PCA. These items include (1) return on investment, (2) cash flow level, (3) level of debt, (4) level of defeat, (5) construction productivity, (6) material defeat level, (7) time of delivery, (8) actual costs vs budgeted costs, (9) project safety level, (10) defeat level (11) level of environmental compliance, (12) number of jobs and (13) contribution to local community development.

Table 4.18 summarizes the total variance explained among the 30 performance measures retained. As can be seen in the table, seven components were extracted and retained with eigenvalues exceeding 1.0, explaining 79.83% of total variance of the dataset. This result is satisfactory as it is well above the 60% threshold recommended in the literature for social sciences like construction management studies (e.g. Hair et al., 2014). Moreover, evidence from the scree plot in Figure 4.5 identified the seven component (factor) with eigenvalues greater than 1.0 at the inflection point, where the line begins to taper off until it reaches a stable plateau and each successive component accounts for smaller proportion of the total variance explained. The results of the scree plot is in agreement with the outcome of total variance explained in **table 4.18**. Further, the results of the communalities for the variables extracted within the seven components (factors) show that all of

them were above the benchmark of 0.50, which signifies the acceptance of the explanation of variance.

The rotated component matrix is shown in **Table 4.19**, which specifies component loadings for the variables (performance measures) under each of the seven components. Additionally, **table 4.20** shows component loadings and the Cronbach's alpha for the extracted components. The seven components extracted from the PCA are explained as follows:

1. The first component accounts for 43.04 percent of the total variance explained among all of the performance measures identified. It is most strongly loaded component with twelve performance measures, of which 6 were related to employee performance and 3 were related to customer performance. This component was titled employee and customer perspective.
2. The second component, which accounted for 10.56 percent of the total variance, contains four performances measures. Variables within this component were primarily related to supplier performance with loadings in excess of 0.70 and was titled supplier perspective.
3. The third component accounted for 6.86 percent of the total variance explained. It is heavily loaded with four performances measures. Further, it contains three variables with strong loading that were related to customer acquisition and two variables relating to some aspects internal process. This component was titled business efficiency and growth perspective. This title is justifiable as many business organizations achieve a large proportion of business growth from customer retention or recurring customers (Lasrado and Uzbeck, 2017).
4. The fourth component (factor) explains 6.21 percent of the total variance. This component groups together four variables relating project performance with loadings in excess of 0.70 and was titled project perspective.
5. The fifth component accounted for 5.07 percent of the total variance, and comprises three performance measures relating to ICT and was named innovation perspective.
6. The sixth component accounted for 4.66 percent of the total variance, and incorporates two measures of environmental performance and was titled environmental perspective.
7. Finally, the seventh component, which accounted for 3.43 percent of the total variance, contains only one performance measure, namely processing time with a component loading in excess of 0.60. Processing time is a key aspect of process management and therefore the component has been labelled internal process management perspective.

Table 4.16 KMO and Bartlett's Test results for performance measures used

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.585
Bartlett's Test of Sphericity	Approx. Chi-Square	953.234
	df	435
	Sig.	.000

Table 4.17 Communalities for performance measures used

Communalities

Measures used	Initial	Extraction
Reward_employees_4.6	1.000	.667
Competency_cover_4.8	1.000	.750
Emp_suggestion_4.7	1.000	.787
Repeat_customers_2.6	1.000	.782
Waste_level_7.4	1.000	.811
Corporate_image_2.8	1.000	.735
Receivables_1.5	1.000	.632
Emp_absenteeism_4.5	1.000	.622
Emp_productivity_4.4	1.000	.824
Cust._satisf_2.1	1.000	.805
Response_time_3.1	1.000	.602
Supplier_lead_time_5.3	1.000	.883
Supplier_satisf_5.4	1.000	.942
On_time_delivery_5.2	1.000	.843
Suppplier_flexibility_5.5	1.000	.899
Customer_growth_2.4	1.000	.835
No_New_Customer_2.3	1.000	.734
Admin_exps_to_sales3.4	1.000	.861
Tender_success_3.5	1.000	.681
Profit_margin_1.1	1.000	.874
Proj_profit_margin_6.4	1.000	.855
proj_productivity_6.5	1.000	.824
Client_satisfaction__6.3	1.000	.910
ICT_appls_const_4.11	1.000	.925
ICT_in_const_4.12	1.000	.932
Use_comput_const_4.13	1.000	.799
Water_consumption_7.3	1.000	.850
Energy_comsuption_7.2	1.000	.776
Emp_satisfaction_4.1	1.000	.738
Processing_time_3.3	1.000	.768

Extraction Method: Principal Component Analysis.

Table 4.18: Total variance Explained for performance measures used

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	12.913	43.044	43.044	12.913	43.044	43.044	6.53	21.767	21.767
2	3.167	10.556	53.6	3.167	10.556	53.6	3.59	11.968	33.735
3	2.057	6.857	60.457	2.057	6.857	60.457	3.548	11.825	45.56
4	1.862	6.207	66.664	1.862	6.207	66.664	3.545	11.816	57.376
5	1.522	5.072	71.736	1.522	5.072	71.736	3.015	10.051	67.428
6	1.398	4.66	76.396	1.398	4.66	76.396	2.469	8.228	75.656
7	1.029	3.43	79.826	1.029	3.43	79.826	1.251	4.17	79.826
8	0.906	3.019	82.845						
9	0.835	2.785	85.629						
10	0.658	2.194	87.823						
11	0.586	1.952	89.775						
12	0.547	1.822	91.598						
13	0.395	1.315	92.913						
14	0.377	1.257	94.17						
15	0.334	1.114	95.284						
16	0.248	0.825	96.11						
17	0.203	0.677	96.786						
18	0.19	0.632	97.418						
19	0.173	0.577	97.995						
20	0.144	0.481	98.476						
21	0.117	0.392	98.868						
22	0.083	0.275	99.143						
23	0.072	0.24	99.383						
24	0.063	0.21	99.592						
25	0.045	0.15	99.742						
26	0.038	0.128	99.87						
27	0.02	0.067	99.937						
28	0.009	0.03	99.967						
29	0.005	0.018	99.985						
30	0.004	0.015	100						

Extraction Method: Principal Component Analysis.

Table 4.19 Rotated Component Matrix for performance measures used

Rotated Component Matrix[a]

	Component						
	1	2	3	4	5	6	7
Reward_employees_4.6	.778						
Competency_cover_4.8	.745						
Emp_suggestion_4.7	.721						
Repeat_customers_2.6	.711						
Waste_level_7.4	.703						
Corporate_image_2.8	.698						
Receivables_1.5	.693						
Emp_absenteeism_4.5	.651						
Emp_productivity_4.4	.564						
Emp_satisfaction_4.1	.550		.518				
Cust._satisf_2.1	.549						
Response_time_3.1	.529						
Supplier_lead_time_5.3		.803					
Supplier_satisf_5.4		.789					
Suppplier_flexibility_5.5		.787					
On_time_delivery_5.2		.763					
Customer_growth_2.4			.796				
No_New_Customer_2.3			.748				
Admin_exps_to_sales3.4			.708				
Tender_success_3.5			.532				
Proj_profit_margin_6.4				.837			
Client_satisfaction__6.3				.829			
proj_productivity_6.5				.799			
Profit_margin_1.1				.711			
ICT_appls_const_4.11					.854		
Use_comput_const_4.13					.797		
ICT_in_const_4.12					.747		
Water_consumption_7.3						.849	
Energy_comsuption_7.2						.780	
Processing_time_3.3	.544						.617

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

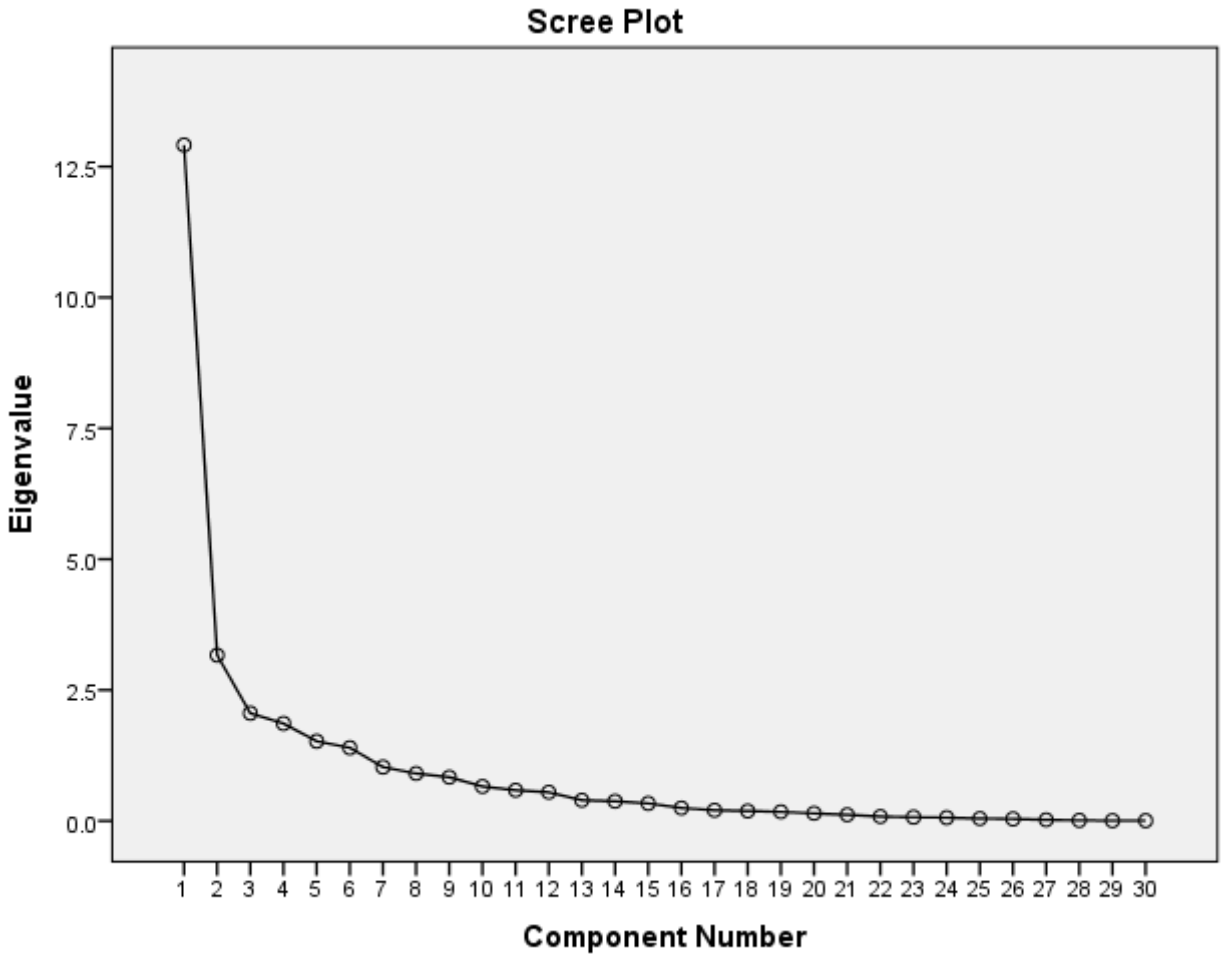


Figure 4.1 Cree Plot for performance measures used by Saint Lucian construction firms

Table 4.20 PCA for performance measures used by St. Lucian construction firms

Component	#	Performance measures	Comp. loading	Classification in original study
Component 1 Employee and customer perspective 43.04% of TVE α = 0.934	1	Rewarding & recognizing employees	0.778	Learning & growth
	2	Employee competency coverage ratio	0.745	Learning & growth
	3	Employees' suggestions	0.721	Learning & growth
	4	Repeat business customer	0.711	Customer
	5	Waste level	0.703	*Environmental*
	6	Corporate image	0.698	Customer
	7	Level of receivables	0.693	*Financial*
	8	Employee absenteeism	0.651	Learning & growth
	9	Employee productivity	0.564	Learning & growth
	10	Employee satisfaction	0.550	Learning & growth
	11	Customer satisfaction	0.549	Customer
	12	Response time to business issues	0.529	*Internal business process*
Component 2: Supplier perspective 10.56% of TVE α = 0.920	1	Supplier lead time	0.803	Supplier
	2	Supplier satisfaction	0.789	Supplier
	3	Supplier flexibility	0.787	Supplier
	4	On time deliveries	0.763	Supplier
Component 3: Business efficiency & growth perspective 6.86% of TVE α = 0.855	1	Customer growth	0.796	Customer
	2	Number of new customer	0.748	Customer
	3	Administration expenses to total sales	0.708	Internal business process
	4	Tender success rate	0.532	Internal business process
Component 4: Project perspective 5.645 % of TVE α = 0.851	1	Project profit margin	0.837	Project
	2	Client satisfaction	0.829	Project
	3	Project productivity	0.799	Project
	4	Profit margin	0.711	*Financial*
Component 5: Innovation perspective 4.492% of TVE α = 0.885	1	Level of ICT application in construction	0.854	Learning & growth
	2	Investment in ICT in construction	0.797	Learning & growth
	3	Percent of employee using computers in construction	0.747	Learning & growth
Component 6: Environment perspective 4.148% of TVE α = 0.857	1	Water consumption	0.849	Environment & community
	2	Energy consumption	0.780	Environment & community
Component 7: Process management perspective 3.43% of TVE α = NA	1	Processing time	0.617	Internal business process

4.5.3 PCA results for use of performance measures

As previously mentioned, Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were conducted in this study to assess the suitability of the PCA. As shown in **table 4.21**, KMO, a measure of sampling adequacy, was 0.615 for the use of performance measures. This value is

above the threshold of 0.50 for sampling adequacy and reflects the suitability of the factor analysis. Furthermore, Bartlett's test of sphericity (df = 435) of 1158.613 and significance value of 0.000, as shown **table 4.21**. This results show that the p-value is less than 0.05, confirming the original data used in the sample were suitable or appropriate for PCA. **Table 4.22** shows the communality analysis of the uses of performance measures, which demonstrates that all 31 measures presented extraction values were greater than the recommended threshold of 0.5, and as result, they were satisfactory for further analysis. These extraction values therefore show that total variance of all the variables were sufficiently explained by the components in the PCA.

The results of the PCA are presented **Tables 4.23 and 4.24**. The results of the PCA shows that the uses of the performance measures were loaded on six components or distinct groupings/constructs with eigenvalues greater than 1.0. Further, the results in Table 4.23 show that the total variance explained (TVE) among the original variables, from which the six (6) components account for 82.35 percent of the total variance. Also achieved is the rotation converged after 11 interactions. In addition, **figure 4.2** depicts the scree plot of eigenvalues and component numbers. It can seen that the inflection point occurs at six components (factors) with eigenvalues greater than 1.0, which is consistent with the results of total variance explained in **table 4.23**.

Table 4.24 shows rotated component matrix, which summarises the component loadings from PCA for the uses of performance measures retained in the study. As already mentioned, the study adopts a cut-off point of 0.50 for the component leading of a variable onto a component since its dataset is small. Accordingly, one variable, communicating compliance to regulators, which was found to have a component loading below the recommended benchmark of 0.5 and was deleted from the further PCA. Therefore, 30 uses of performance measures were retained from the analysis. It is worthy to note communicating compliance to regulators was the highest ranked in the questionnaire survey, which was the lowest ranked variable in the PCA.

As shown in table 4.20, one variable, project risk, exhibits cross loading, where it has two component loadings exceeding the threshold value 0.50. In this case, the variable is included in the component where it component loading has the better or best fit and is higher than cross loadings.

As can be seen from table 4.21, the generated components do not fully confirm to the original usage classification used in this research. After carefully consideration of the uses of performance measures in each of the component, the six (6) components were named or labelled as follows:

1. Component 1 was labelled monitoring and evaluating use. It accounted for 51.94 percent of the total variance and was heavily loaded with eleven variables. It includes promoting cooperation and coordination, progress, feedback, evaluating performance, among others.
2. Component 2 accounted for 9.11 percent of the total variance. It was deeply loaded with six variables, which include strategic capability, strategy execution, strategic assumptions, strategic change and the like. Accordingly, it was labelled strategy management use.
3. Component 3 explains 6.81 percent of the total variance. It was loaded with six variables. Financial risk, strategic risk and operation risk are some examples of the variables of this component. Accordingly, it was labelled managing risk use.
4. Component 4 was labelled governance and learning, which accounts for 5.75 percent of the total variance. It was loaded with three variables, where accountability and reputation were received the most significantly loadings in the component. Therefore, the name is justified as governance emphasizes that those charge with it must demonstrate individual and collective accountability in order to ensure the sustainability of their construction firms and increase in stakeholder values. Furthermore, reputation plays a vital role in the governance of construction firms in terms of integrity, legitimacy among others.
5. Component 5 was labelled benchmarking use. Three variables were loaded onto this component, representing 4.45 per cent of total variance explained.
6. Component 6 was termed rewarding behaviour use. Only one variable was loaded onto this component, representing 4.28 per cent of total variables.

Table 4.21 KMO and Bartlett's Test for the use of performance measures

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.615
Bartlett's Test of Sphericity	Approx. Chi-Square	1158.613
	df	435
	Sig.	.000

Table 4.22 Communalities for the use of performance measures

Communalities		
Uses	Initial	Extraction
MP_prrogress1	1.000	.834
MP_evaluate2	1.000	.769
MP_practices3	1.000	.735
SM_planning1	1.000	.840
SM_execution2	1.000	.867
SM_Focus3	1.000	.789
SM_DM4	1.000	.728
SM_capab5	1.000	.811
SM_Change6	1.000	.838
SM_Assumptions7	1.000	.707
Com_Internal1	1.000	.855
Com_External2	1.000	.833
Com_Benchmark3	1.000	.849
Com_Divsions5	1.000	.867
Beh_monitor1	1.000	.722
Beh_Motivation2	1.000	.877
Beh_Role3	1.000	.877
Beh_Coop4	1.000	.882
Beh_Rewards5	1.000	.807
Beh_relationships6	1.000	.794
LI_Feedback1	1.000	.737
LI_highlevel2	1.000	.830
LI_Improvement3	1.000	.774
LI_Reputation4	1.000	.904
LI_Accountability5	1.000	.884
LI_Benchmark6	1.000	.949
Risk_Strategic1	1.000	.851
Risk_operation2	1.000	.804
Risk_Financial3	1.000	.827
Risk_project4	1.000	.865

Extraction Method: Principal Component Analysis.

Table 4.23 Total Variance Explained for use of performance measures

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	15.582	51.942	51.942	15.582	51.942	51.942	7.673	25.577	25.577
2	2.733	9.109	61.051	2.733	9.109	61.051	4.859	16.196	41.773
3	2.043	6.811	67.862	2.043	6.811	67.862	4.581	15.272	57.044
4	1.727	5.755	73.617	1.727	5.755	73.617	3.237	10.79	67.834
5	1.336	4.454	78.071	1.336	4.454	78.071	2.595	8.649	76.483
6	1.285	4.282	82.353	1.285	4.282	82.353	1.761	5.87	82.353
7	0.865	2.884	85.237						
8	0.646	2.154	87.39						
9	0.58	1.934	89.324						
10	0.498	1.659	90.983						
11	0.429	1.429	92.412						
12	0.364	1.214	93.625						
13	0.341	1.138	94.763						
14	0.298	0.993	95.756						
15	0.262	0.875	96.631						
16	0.258	0.86	97.491						
17	0.147	0.489	97.98						
18	0.121	0.403	98.383						
19	0.11	0.366	98.749						
20	0.086	0.287	99.036						
21	0.071	0.238	99.274						
22	0.054	0.18	99.454						
23	0.05	0.166	99.621						
24	0.038	0.128	99.748						
25	0.028	0.093	99.841						
26	0.023	0.076	99.916						
27	0.012	0.039	99.956						
28	0.008	0.028	99.984						
29	0.003	0.009	99.993						
30	0.002	0.007	100						

Extraction Method: Principal Component Analysis.

Table 4.24 Rotated Component Matrix for the use of performance measures

Rotated Component Matrix[a]

	Component					
	1	2	3	4	5	6
Beh_Coop4	.868					
Beh_Motivation2	.855					
Com_Internal1	.830					
Beh_Role3	.808					
MP_prrogress1	.805					
Com_External2	.731					
MP_evaluate2	.692					
LI_Feedback1	.680					
Beh_relationships6	.651					
Beh_monitor1	.577					
MP_practices3	.575					
SM_execution2		.789				
SM_capab5		.735				
SM_planning1		.702				
SM_Focus3		.695				
SM_Assumptions7		.657				
SM_Change6		.643				
Risk_Financial3			.817			
Risk_operation2			.786			
Risk_Strategic1			.767			
Risk_project4		.501	.666			
LI_Improvement3			.571			
SM_DM4			.534			
LI_Reputation4				.854		
LI_Accountability5				.722		
LI_highlevel2				.596		
Com_Divsions5					.884	
LI_Benchmark6					.750	
Com_Benchmark3					.609	
Beh_Rewards5						.824

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 11 iterations.

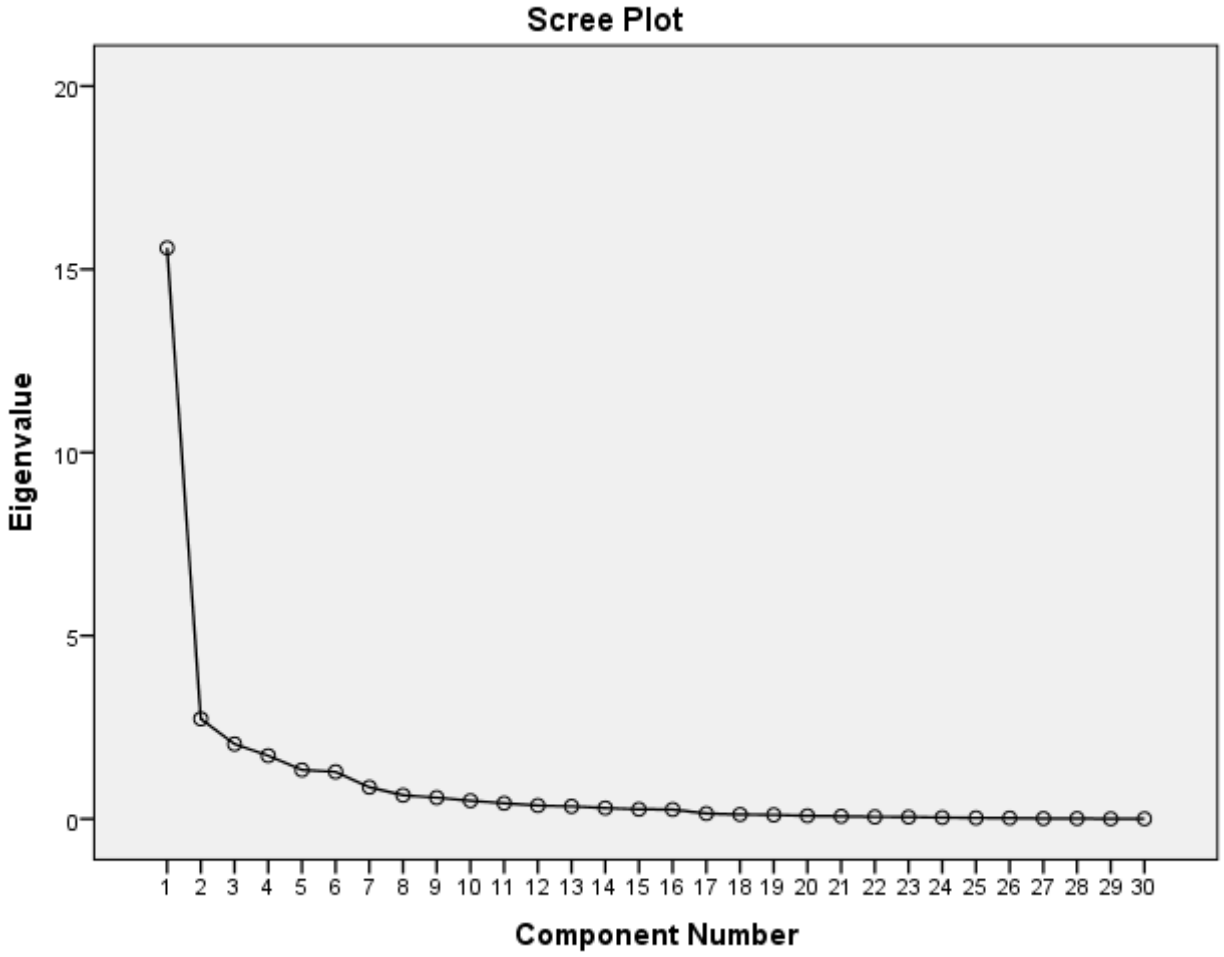


Figure 4.2 Scree Plot for the use of performance measures

Internal reliability

The Cronbach's alpha was calculated for each the extracted components to assess the internal consistency, which is illustrated in table 4.20. The results show that all the extracted components achieved Cronbach's alpha (α) higher than 0.80, indicating an excellent internal consistency and reliability (with the exception of Component 6, which only had one variable and hence could not be tested for internal consistency). The lowest Cronbach's alpha (α) recorded was 0.846.

Furthermore, the internal consistency of all the variables of the extracted components was very high with a Cronbach's alpha value of 0.964.

Table 4.25 Factor analysis for use of performance measures by St. Lucian construction firms

Component	#	Use of performance measures	Comp. loading	Classification in original study
Component 1 Monitoring & evaluating 51.942% of TVE α =0.956	1	Cooperation and coordination	0.868	Influence behavior
	2	Motivation	0.855	Influence behavior
	3	Internal comminution	0.830	Communications
	4	Monitoring progress	0.808	Measure performance
	5	role understanding	0.805	Influence behavior
	6	External communication	0.731	Communications
	7	Evaluate performance	0.692	Measure performance
	8	Feedback	0.680	*Learning & improvement*
	9	Managing relationship	0.651	Influence behavior
	10	Monitoring behaviour	0.577	Influence behavior
	11	Learning existing work practices	0.575	Measure performance
Component 2: Strategy management use 9.109% of TVE α =0.916	1	Strategy implementation/execution	0.789	Strategy management
	2	Strategic capabilities	0.735	Strategy management
	3	Strategic planning (formulation)	0.702	Strategy management
	4	Focusing attention on strategic issues	0.695	Strategy management
	5	Challenging strategic assumptions	0.657	Strategy management
	6	Managing strategic change	0.643	Strategy management
Component 3: Managing risk use 6.811% of TVE α =0.915	1	Financial risk	0.817	Managing risk
	2	Operational risk	0.786	Managing risk
	3	Strategic risk	0.767	Managing risk
	4	Project risks	0.666	Managing risk
	5	Performance improvement	0.571	*Learning & improvement*
	6	Strategic decision making	0.534	*Strategy management*
Component 4: Governance and Learning use 5.755 % of TVE α = 0.887	1	Improve firm's reputation	0.854	Learning & improvement
	2	Accountability	0.722	Learning & improvement
	3	High level learning	0.596	Learning & improvement
Component 5: Benchmarking use 4.454% of TVE α =0.846	1	Communication between head office and division	0.884	Communication
	2	Benchmarking practices -improvement	0.750	*Learning & improvement*
	3	Communicating benchmarking	0.609	Communication
Component 6: Rewarding behaviour use 4.282% of TVE α = NA	1	Rewarding & compensating behaviour	0.824	Influence behavior
Overall **α = 0.964**		All uses of performance measures		

4.5.4 PCA for CPMM implementation barriers

In the study, Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were conducted to assess the suitability of PCA for CPMM framework implementation barriers. According to **table 4.26,** KMO, a measure of sampling adequacy, was 0.754 for the barriers to the implementation of CPMM framework. This KMO value is above the threshold of 0.50 for sampling adequacy, indicating the appropriateness of the PCA. Furthermore, Bartlett's test of sphericity (Approx. Chi-Square = 423.885; df = 120) was statistically significant (sig.) at 0.000. This shows that the p-value is less than 0.05, indicating that the original data used in the sample were suitable for PCA.

The communality analysis illustrated in table 4.27. The results show that all 16 barriers to the successful implementation of a CPMM framework presented extraction values greater than 0.5, implying that the total variance of all the barriers were sufficiently explained by the components generated by the PCA.

Table 4.28 shows the total variance explained (TVE) for CPMM framework implementation barriers. The results in table indicate that the barriers to the successful implementation of CPMM framework were loaded on three (3) components or distinct groups/constructs with eigenvalues greater than one. The total variance explained (TVE) among the original variables, from which the three (3) components account for 73.158 percent of the total variance. Further, component 1 accounts for 52.818 percent of the total variance in the identified barriers to CPMM framework implementation in construction, component 2 accounts for 11.931 percent of the total variance and component 3 accounts for 8.409 percent of the total variance. Furthermore, the rotation converged after 5 interactions. Figure 4.3 depicted Scree plot for CPMM framework implementation Barriers. The inflection point occurs at the third component, which is in line with the results of the total variance explained in table 4.28.

Table 4.29 and 4.30 summarise the loadings from the PCA for all the barriers to the successful implementation of a CPMM framework. All the barriers has component loadings above the recommended benchmark of 0.5 or above. Table 4.29 shows that one barrier, lack of clear strategies, has a cross loading where it has two component loadings exceeding the threshold value

0.50. In this case, the variable is included in the component where it component loading has the better or best fit and is higher than the other component loading.

Very importantly, meaningful names or labels were assigned to the three extracted components as follows:

1. Component 1 was named as ‘commitment and culture barrier’. This component include factors such as lack of management support, lack of employee involvement and lack of knowledge of PMM concepts and inappropriate organizational culture among others;
2. Component 2 was labelled as ‘organizational background and resources’ barrier as it consists of the variables such as lack of ICT infrastructure and high cost of CPMM framework implementation. Furthermore, this component includes the two most important barriers perceived by the survey respondents, namely higher implementation costs and inadequate resources for CPMM framework (see table 4.8).
3. Component 3 was labelled ‘external barriers’ as it related to external environmental uncertainties like political and economic uncertainties.

The Cronbach’s alpha was calculated separately for each extracted component of variables and overall for all the variables to assess internal consistency. Table 4.22 shows the Cronbach’s alpha (α) values for each component, ranging from 0.0.832 to 0.930 (and therefore greater than the recommended value of 0.70). Moreover, Cronbach’s alpha (α) value was 0.937 for the all the 16 barriers of the extracted components. These results indicate excellent internal consistency and reliability among the variables.

The results of the PCA show that only the external barrier title was retained, whilst the internal barrier construct was split and recognized as two separate constructs namely ‘commitment and culture barrier’ and ‘organizational background and resources’.

Table 4.26 KMO and Bartlett's for CPMM framework implementation barriers

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.754
Bartlett's Test of Sphericity	Approx. Chi-Square	423.885
	df	120
	Sig.	.000

Table 4.27 Communalities for CPMM framework implementation barriers

Communalities

	Initial	Extraction
Int_Lacktopmgt1	1.000	.895
Int_Lackemployee2	1.000	.767
Int_Lackknow3	1.000	.803
Int_Lackbenefit4	1.000	.844
Int_Highcost5	1.000	.575
Int_Lackres6	1.000	.711
Int_LackICT7	1.000	.718
Int_Lackstrategy8	1.000	.829
Int_Firmsize9	1.000	.723
Int_Culture10	1.000	.737
Ext_Competition1	1.000	.623
Ext_Regulations2	1.000	.616
Ext_Technology3	1.000	.635
Ext_Economic4	1.000	.607
Ext_Political5	1.000	.844
Ext_Social6	1.000	.779

Extraction Method: Principal Component Analysis.

Table 4.28 Total Variance Explained for CPMM framework implementation barriers

Table 4.16 Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.451	52.818	52.818	8.451	52.818	52.818	4.887	30.546	30.546
2	1.909	11.931	64.749	1.909	11.931	64.749	3.825	23.908	54.454
3	1.345	8.409	73.158	1.345	8.409	73.158	2.993	18.703	73.158
4	0.827	5.168	78.326						
5	0.669	4.18	82.506						
6	0.597	3.733	86.239						
7	0.536	3.353	89.592						
8	0.387	2.422	92.013						
9	0.294	1.836	93.85						
10	0.249	1.558	95.408						
11	0.226	1.41	96.817						
12	0.16	0.999	97.816						
13	0.139	0.869	98.685						
14	0.107	0.666	99.351						
15	0.07	0.439	99.789						
16	0.034	0.211	100						

Extraction Method: Principal Component Analysis.

Table 4.29 Rotated Component Matrix for implementation barriers

Rotated Component Matrix[a]

	Component		
	1	2	3
Int_Lacktopmgt1	.933		
Int_Lackbenefit4	.874		
Int_Lackknow3	.862		
Int_Lackemployee2	.785		
Int_Culture10	.740		
Ext_Competition1	.545		
Int_Firmsize9		.842	
Int_LackICT7		.770	
Int_Lackres6		.715	
Int_Lackstrategy8	.525	.709	
Ext_Regulations2		.641	
Int_Highcost5		.619	
Ext_Political5			.903
Ext_Social6			.842
Ext_Economic4			.613
Ext_Technology3			.606

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

As shown table 4.29 above, lack of top management support was a top barrier obtaining the highest component loading under component 1. Meanwhile, firm size was top barrier obtaining the strongest component loading under component 2 and political uncertainty was the top barrier obtaining the strongest component loadings under component 3.

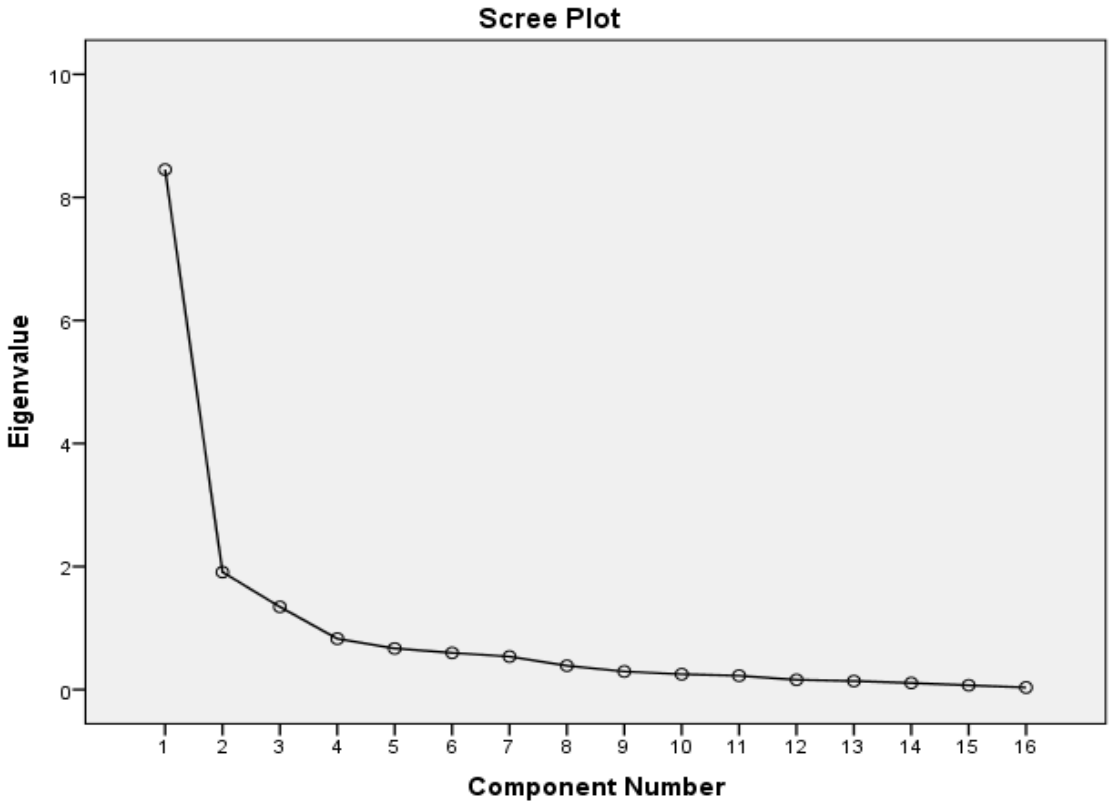


Figure 4.3 Cree plot for CPMM framework implementation barriers

Table 4.30 Factor analysis for CPMM framework barriers

Component	#	Implementation barriers	Comp. loading	Classification in original study
Component 1 Commitment and culture barriers 52.818% of TVE $\alpha = 0.930$	1	Lack of top management support	0.933	Internal barrier
	2	Lack of understanding of benefits from CPMM framework	0.874	Internal barrier
	3	Lack of knowledge of the PMM concept	0.862	Internal barrier
	4	Lack of employees' involvement and participation	0.785	Internal barrier
	5	Inappropriate organizational culture	0.740	Internal barrier
	6	Level of competition	0.545	External barrier
Component 2: Organizational background and resources barriers 11.931% of TVE $\alpha = 0.894$	1	Firm size	0.842	External barrier
	2	Inadequate ICT infrastructure	0.770	Internal barrier
	3	Lack of resources	0.715	Internal barrier
	4	Lack of clear strategies	0.709	Internal barrier
	5	Legislation & Regulation	0.641	External barrier
	6	High implementation cost	0.619	Internal barrier
Component 3: Environment barriers 6.743% of TVE $\alpha = 0.832$	1	Political uncertainty	0.903	External barrier
	2	Social uncertainty	0.842	External barrier
	3	Economic uncertainty	0.613	External barrier
	4	Technology reluctance and uncertainty	0.606	External barrier
Overall $\alpha = 0.937$		All implementation barriers		

Chapter 5 Case Studies: Within case analyses and findings

5.1 Introduction

This chapter presents within (individual) case analysis and findings of the two case studies conducted in the Saint Lucian construction industry in order to meet the research aims and objectives and to answer the research questions. It also presents the contextual background of each case study firm.

The findings for each case study (namely case A and Case B) presented under the relevant research objectives. Moreover, the findings were emerged from the 13 semi-structured interviews with the construction managers of the two case firms and the analysis of documents collected from the cases. The face-to-face semi-structured interviews were recorded and transcribed. The transcripts of interviews were coded and then analyzed using thematic analysis. The focus of the two case studies was to explore and explain themes and categories that have emerged from both the literature review and the questionnaire survey. Furthermore, direct quotes were extracted from the transcripts of semi-structured interviews to support and illuminate the case findings. Verification was received for most of transcripts of the interviews by the interviewees to ensure that accurate data were captured.

In analyzing the case study, consideration was given to the frequency of mentions of the themes or variables by the interviewees. A high level of mentions of a theme would reflect a strong perception that this theme is important. Furthermore, themes that were mentioned by interviewees, but not included in the question schedule or prompt that was provided to them in advance of the interviews are shown in *italic* in the tables below.

5.2 Case A

5.2.1 Textual background of Case A

Case A is a leading and successful construction firm in Saint Lucia. It is a group of companies, which has two subsidies or associate companies. At the time of this study, its core business

activities are building construction, engineering and infrastructure works, construction related professional services, construction financial services and quarry and mining. It offers products and services to both public and private clients. Moreover, Case A has been operating in Saint Lucia for approximately 22 years, and it currently employs approximately 1500 people.

5.2.1.1 Organizational purpose and identify

Case A has articulated the clarity of its purpose in its vision, mission and values. The vision of Case A is to be the most professional, innovative and dynamic construction group/company in Saint Lucia and the wider Eastern Caribbean. Moreover, its mission is to build organizational and institutional capacity, create wealth and employment, encourage innovation, develop professional capabilities, foster relationships, deliver best quality products and services and constantly ensure that service provisions are beyond expectation. Meanwhile, Case A embraces three core values that would drive the behaviour of its members towards the achievement of its goals and objectives namely customer focus, innovation and quality. These values underpin the mission and strategies of Case A. In summary, the vision and mission of Case A is to outperform its competitors in the marketplace by strengthen its construction market leadership in the Eastern Caribbean and creating value for stakeholders.

5.2.1.2 Governance and organizational structure

A board of directors manages the corporate governance of Case A. In so doing, the board provides strategic direction, and monitors and manages top management and organizational strategy processes. Case A appears to adopt a divisional structure for its strategic business units (SBUs) and hence has a decentralized structure. It operates its four SBUs, namely, head office, hardware store, construction and heavy industrial equipment, and quarry and mining from different geographical locations in Saint Lucia. Case A has organized its SBUs according to relevant business and operations functions. It is worthy to note that each SBU reports directly to the Board of Directors (see figure 5.1). Some the core business functions of the SBUs of Case A are as follows:

1. The head office undertakes activities related to inter alia finance, performance management, human resources, business development and marketing, compliance and risk management, corporate affairs, project financing, and sustainability.

2. The construction hardware shop offers building and construction materials and other items to both internal market and external markets.
3. The construction and heavy industrial equipment unit undertakes construction related activities such executing construction projects such roads, bridges and commercial buildings and offering construction related professional services. The key functions of this SBU are construction services, heavy industrial equipment and construction management consulting services.
4. The quarry and mining unit involves in the extraction and processing of minerals such as stones, rocks, and gravels using mineral process plants to produce aggregates for use in construction. The resultant construction concrete aggregates are offered to clients in both internal and external markets. Accordingly, quarry production operation, quarry administration and maintenance operations are some of the key functions of the quarry and mining plant.

The founder, CEO and team leader of Case A is the chairperson of its board of directors. The CEO seeks to obtain business opportunities for, and provides coordination for the Case A. Case A has leaders, managers and employees for each SBU. The business unit leaders and managers of the Case A have considerable autonomy to make decisions and control resources. To influence its PMM and strategy, Case A operates within a divisional organizational structure, which is depicted in Figure 5.1. Generally, the corporate level at head office (top-down level) establishes the corporate strategies and priorities of Case A, which are then cascaded throughout the SBUs, i.e. tactical and operational levels. This approach would promote dialogue and understanding of the Case A's corporate strategies at all levels. Furthermore, Case A tries to balance the views and objectives of key stakeholders.

Evidence shows that there is some alignment between the business strategies of SBUs and the corporate strategies of Case A. The level alignment ensures cohesion between different business units and thereby tries to reduce duplication of efforts. Meanwhile, strategies are developed at head office as well as at the SBUs to meet the needs of the SBUs and the firm as a whole. SBUs will often communicate their performance information to the corporate level at head office. However, there is limited evidence to suggest that a comprehensive set of performance measures from the corporate level are cascaded throughout the firm.

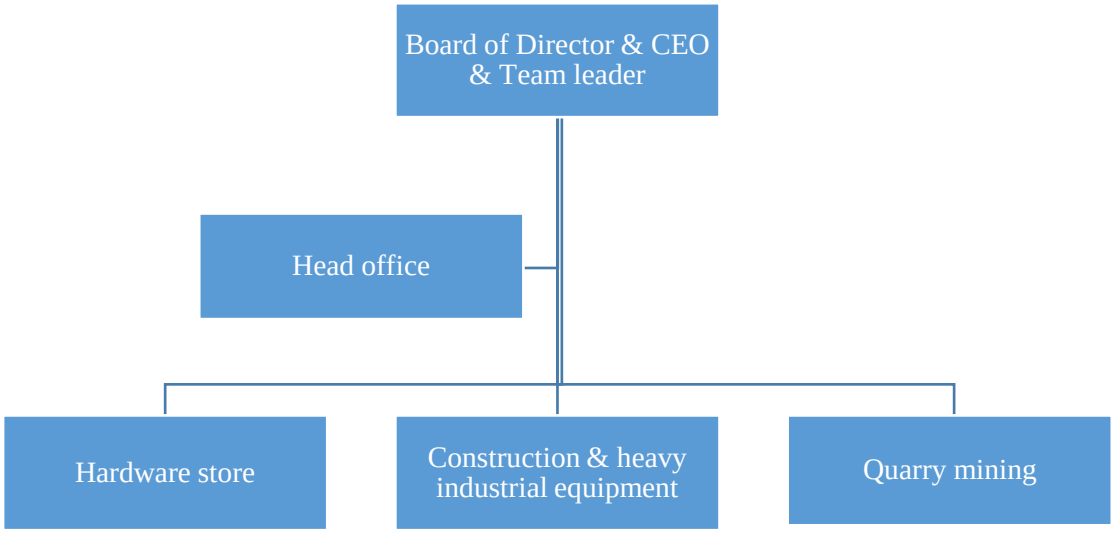


Figure 5.1 Organizational structure of Case A

5.2.1.3 Corporate strategies

The Case A has a corporate strategic plan, which covers a five-year period and focuses around its vision, mission, strategic objectives and priorities. The Case A strategies are oriented towards maintaining or strengthen its strong position in the Eastern Caribbean construction markets and outperform industry its competitors. In so doing, it focuses on providing the necessary products and services to meet the construction needs of clients in Saint Lucia and the wider Eastern Caribbean market. In general, Case A has chosen a hybrid competitive strategy involving cost leadership and focus differentiation of products, services and business approach to meet the demands of clients in the construction industry. In particular, its hybrid strategy is based on relatively high-perceived value of goods and services and their low prices to gain competitive advantage and increase market.

Case A attempts to differentiate itself from its competitors based on price, quality, innovation, and business approach. The majority of interviewees confirm the differentiated approach to Case A's competitive strategies. For example, RA5 noted:

> Well, our company has increased its resources and capacity over the years, which put it in a position to offer its clients lower and competitive prices for many of its products and services. I think this has allowed us to increase our volumes and capture a large share of the market.

Another interviewee, RAI went to say:

> The business models that we deploy to compete and match our competences are based mainly on lower prices. The company's capabilities, integration, logistical strength, and good knowledge of the market have caused it to offer lower prices than its competitors, and win competitive bids in the market.

The above quotes suggest that the strategies of Case A are coalesced around the resource-based approach to enhance its competitiveness in the construction market in Saint Lucia and by extension the Eastern Caribbean. Meanwhile, some of the interviewees suggest that Case A places great emphasis on developing new value added products and services for its clients and customers. In this vein, R3 added, "*we are also targeting higher-end customers and strategic partners who are demanding high quality products and services, and shorter lead time. …contract negotiation is critically in this regard".* This suggests that Case A pursues a differentiation strategy in the construction industry as a strategic focus that targets higher end (income) clients and customers who are prepared to pay a premium for higher quality products and services.

Further Case A attempts to differentiate itself from its competitors in the market in terms of its service provision through its all-inclusive approach and project financing mechanism. Most of the interviewees suggest that Case A provides construction project financing to its qualified clients and it is the only construction firm in Saint Lucia offering financial services to clients. To illustrate this point RA1 stated, *"Recently, we have offered construction clients project financing to assist them to obtain their tools and equipment, and affordable dwellings. I can say that this has been going on well".*

Market penetration and growth, and diversification are the key strategy options that have been used by Case A for its growth and value creation. Moreover, Case A pursues its strategies mainly through organic development, and strategic alliances and partnering. Evidence suggests that competitive capabilities, productivity improvement, competitive and lower prices compared to competitors and diversified businesses are key methods used by Case A to pursue its strategies and development. For example, when commenting in the context of the development of performance measures by Saint Lucian construction firms, RA4 highlighted the importance of diversification of Case A by stating:

> Well, clearly I can see that the performance measures use by our company have been developed from its business strategies. Our business strategies are based on integration and diversification. Moreover, our company operates at key points in the construction industry's value chain ranging from extracting key raw materials at out quarry and mining plant to the finished project and retailing of goods at the our hardware in order to meet the varied needs of our clients. …. we are also undertaking works in other Eastern Caribbean regional markets. We, therefore, plan to leverage our resources to increase our presence in our existing markets and exploit new markets.

Furthermore, RA1 noted, "*to a great extent we value the good relationships built with clients and suppliers*".

Table 5.1 summarises the key strategic options that Case A has chosen and the methods used to pursue its strategies in the marketplace.

Table 5.1 Key strategic directional options & methods of development

	Strategy direction	**Methods of pursuing strategies**	
	Options	**Organic or internal development**	**Joint development**
1	Market penetration and growth	Increases or maintains its market share by using resource productivity improvement; competitive and discounted prices, and marketing and branding abilities	Collaboration and alliances with other suppliers and customers/clients by using partnering capabilities, negotiation capabilities and monitoring mechanisms.
2	Concentric Diversification horizontal	Offers a diverse range of products and services in both existing and new markets using key resources, industry knowledge, expertise, and marketing abilities.	Alliance with both local and regional suppliers and customers/clients by using partnering capabilities, negotiation capabilities and monitoring mechanisms

5.2.1.4 Corporate culture

Case A recognizes that corporate culture plays a vital role in the achievement of its mission, strategies and overall performance as well as in successful management change. It tries to strike a balance between adaptive culture that embraces change, values customers and other stakeholders and non-adaptive culture focuses on systematic decision process, incrementalism, predictability and risk aversion in order to maintain or improve its organizational performance. The head office is responsible for ensuring that the corporate culture (actions, attitudes and behaviours) is consistent with the achievement of its goals and objectives and goal congruence. In so doing, the

department would be involved in the dissemination of cultural information to organizational members and in implementation of strategies in order to optimize organizational performance.

5.2.1.5 Business models of Case A

Case A applies relevant business models in its operations to compete and match its competences and resources in order to meet the needs of its construction markets. It uses its business models for leveraging its five competitive strengths towards organizational performance as follows: (1) balanced portfolio, (2) strong strategic capabilities, (3) construction project management, (4) stronger businesses and (5) corporate social responsibility. They are summarized below:

1. **Balanced portfolio** – The SBUs of Case A are diversified over a comprehensive range of products and services in order to reduce its exposure to significant business risks across all hierarchical levels and meet the needs and wants of clients and customers;
2. **Strong strategic capabilities/resources** – Case A over the years has gained financial strength through financial capacity, constant focus on financial control and strong cash generation to undertake value-adding investments, to reduce its cost of capital, to realise growth and to create and improve business value. It also has utilized its financial strength to provide project financing to construction clients. Moreover, Case A has economies of scale and scope in the national construction market, as such offers competitive and lower prices to their clients.
3. **Construction project management** – Case A has an extensive and proven record of accomplishment in the delivery of successful construction projects of all sizes and scope in the Saint Lucian construction market. It has established management systems to manage construction projects for ensuring the generations of above average returns on investments, its continued growth and improved business value. When necessary, the leadership and management of Case A hire staff, contractors and subcontractors with good project management competencies to manage all aspect of its projects.
4. **Stronger businesses** – Case A has a proven record of accomplishment in obtaining strong returns on investments by applying collective knowledge, experience and expertise to generate improvements in the performance and development of its SBUs. Recently, it has placed emphasis on its business development and marketing to support its growth. Its business development activities include ongoing investment to improve capacity, quality

and efficiency of operations. In addition, It focus on retaining existing, and acquiring new clients and hence increasing its market share, building mutual beneficial relationships with key stakeholders, client engagement and education, and business intelligence generation.

5. **Corporate social responsibility (CSR)** – Case A develops and implements policies to meet at least its minimum corporate social responsibility requirements. In so doing, Case A continues to strengthen the relationships it has built with its key stakeholders including customers, government, employees and the local communities. Furthermore, case A has not only focused on regulatory compliance but also provided support for educational, health and developmental needs of the local communities in Saint Lucia. Importantly, Case A focuses on producing or offering high quality products and services in its markets as part of its corporate social responsibility.

In general, evidence suggests that the business models of Case A have been successful. However, it is facing some challenges including inter alia regulatory pressures, greater competition from competitors with similar products and services in the market and challenging economic conditions in Saint Lucia and the Eastern Caribbean.

5.2.1.6 Market and environment

As mentioned earlier, Case A undertakes construction works in both the domestic and Eastern Caribbean regional markets. It main market focus is to increase its competitiveness and market share in these construction markets. It categories each construction market into internal and external markets, as depicted in table 5.2 below.

Table 5.2 Construction markets of Case A

Domestic market (St. Lucia)	**Caribbean regional markets**
Internal	Internal
External	External

Some interviewees highlighted the importance of internal market (internal customers and suppliers) in providing competitive advantage to Case A. In essence, internal market is where one SBU supplies inputs and/or outputs to other SBUs and includes the internal purchases by

organizational members. For example, RA4 noted, *"Generally, about 90 percent of the all inputs for any construction project we undertake would come from our own businesses. This will allow us to complete projects on time and hence comprehensively satisfy our customers. We also do allot of business with our staff".* Evidence shows that Case A is using negotiated transfer pricing mechanisms, negotiated processes and its established service management sub-business unit to ensure the controllability of its internal market.

Over the past 15 years, Case A has achieved sustainable growth in the dynamic and competitive construction market, particularly, in its asset base and turnover. More specifically, Case A has increased it tangible and intangible assets over the recent years as a means of responding to the dynamic construction environment. Its current annual turnover is approximately £11.25 million (Easter Caribbean $40 million). The financial controller of Case A, RA3 commented on it business growth:

> […] Our company has grown over the years in light of the long economic recession that the country is experiencing. In fact, our continued growth is mainly due to our competitiveness, increased asset base, securing some major contracts from clients and providing a project financing mechanism to our construction clients in good financial standing.

Moreover, there is evidence to suggest that Case A is growing at a slower rate over the past few years. The interviewed managers perceived that this trend would continue in immediate future because of the reduced industry outputs, related increasing competition and environmental uncertainty. Consequently, the Case A plans to concentrate on improving its PMM practices as well as exploring attractive growth opportunities through diversification to reverse this trend.

Furthermore, document analysis shows that Case A obtains annually for the past five years approximately 65 percent repeat clients from its construction markets. It also plans to maintain or increase on the level of its repeat business. Case A has identified four methodologies for its success in its construction markets as follows: customized hands on approach, creative thinking, team and client collaboration, and use of proven technologies and skills.

5.2.1.7 Future development and growth

The future developments of the Case A hinge on maintaining its leadership role in the Saint Lucian construction industry and the Eastern Caribbean. Document analysis indicates that Case A plans to pursue the following strategic imperatives as part of its future developments:

- Continues to be innovative in leveraging technology, and recognizing and serving propitious niche markets.
- Commits to ensuring quality customer satisfaction with effective training thus resulting in offering service beyond expectation.
- Continues to attract and engage innovative thinkers and professionals who can provide practical solutions to the challenges of the Case A and the industry as a whole.
- Continues to enhance competencies of its human resources through training, in order to increase the level of their commitment to the firm.
- Continues to use innovative communications and project management tools, and invest in modern equipment in order to support its business models and exploit attractive growth opportunities.
- Commits to creatively developing new value added products and services for our customers;
- Continues to set high standards to effect positive changes at organizational and nationwide levels.

In summary, the future development of Case A relies on meeting customer satisfaction and expectation, leveraging ICT, innovation, market expansion and developing its HRM.

5.2.2 Findings by research objectives for Case A

Table 5.3 depicts the general demographics of the seven interviewed respondents. It can be seen from the table that respondent's years of experience in the industry on average is about 16 years. Almost all the interviewed respondents has a Bachelor's degree. Overall, the level of education and experience of respondents strengthen the credible of their responses and reliability of the findings in this study.

Table 5.3 Demographic profile of respondents from Case A

Interviewee	Position	Professional background		Experience in construction industry
		Area of expertise	qualification	
RA1	Operations duty manager	Business Management	BSc.	8 years
RA2	Project manager	Civil engineering and construction management	MSc., BSc.	25 years
RA3	Financial Controller	Accounting and Finance	BSc.	17 years
RA4	Business Development Executive	Technical and quality services	Diploma	7 years
RA5	Maintenance manager	Mechanical maintenance	BSc.	15 years
RA6	Warden manager	Human Resources management	Postgraduate Diploma	5 years
RA7	General manager-Plant engineering and maintenance	Civil engineering and construction management	BSc.	33 years

The findings emerging from Case A are presented underneath the relevant research objectives as follows:

5.2.2.1 Objective 2 Assessing the performance of Case A

This research objective examines the extent to which Case A is using performance measures within the identified 7 perspectives, CSFs and performance taregt to evaluate its performance.Also, the extent to which Case A uses its performance measures is presented under this objective.

5.2.2.1.1 Financial perspective

The evidence derived from the interviews (see table 5.4) and document analysis show that profit margin, return on investment, cash flow level and total asset growth are the four most extensively used financial performance measures by Case A. Expressing views on financial performance measures of Case A, RA3 stated:

> Profit and cash flow levels are definitely important measures of performance in our company. We monitor these measures very closely, especially in periods of recession. ….I can say that allot of our profits are retained and ploughed back in the company to support its expansion over the years.

Another interviewee, RA1 noted, "*I would say on this one, i.e. for our financial aspect, return on investment is critical to us. We also look at the profit margin and cash flow levels, especially to pay commissions and other benefits to staff"*. Moreover, the financial controller (RA3) went on to remark, "*We are also concerned about improvement in the company's balance sheet. Therefore,*

growth in its total assets is an important measure to us. As you are ware, it gives an indication of our competitive position in the market".

In addition, there is some case evidence to shows that the level of debt and level of receivables are important measures used to assess financial performance of Case A. The following quotations illustrate this viewpoint. *"Debt level is an important aspect of our finance. We try to keep a certain level of debt that would allow the company's to meet its planned expansions and new investments"* (RA1). Additionally, *"As a norm in industy, we give credit to our clients to maintain our customer base, achieve profitable repeat business and hence gaining profit margins from sales. Therefore, receivables is an essential aspect of our financial management, which we monitor closely"* (RA3).

In contrast, profit growth, current ratio, sales (turnover) growth and payable level were perceived to be the least adopted financial performance measure used in the firm. During the interviews, only one interviewee on the contrary suggested that sales (turnover) growth is a particularly useful financial performance measure in Case A.

Table 5.4 Frequency of mentions of measures within the financial perspective of Case A

Financial performance measure	**Mention by**
Profit or Net profit margin (%)	RA1, RA2 RA3, RA4, RA5, RA6, RA7=7
Return on Investment	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Current ratio (times)	0
Cash flow level	RA1, RA2, RA3,, RA4, RA5, RA6, RA7=7
Receivables turnover (days)	RA3, RA4, A5 = 3
Sales (turnover) growth rate (%)	RA3=1
Net profit growth rate (%)	0
Level of debt (indebtedness)	RA1, RA3, RA6 = 3
Debt ratio - Total debt ÷ Total assets ratio (%)	0
Interest coverage ratio (times)	0
Total assets growth	RA1, RA3, RA4, RA6, RA7=5
Payable level	RA3, RA4=2

5.2.2.1.2 Customer perspective

Evidence regarding the adoption of measures within the customer perspective reveals that the four most widely used customer performance measures by Case A were customer or client satisfaction rating, percentage of repeat customers/clients, number of new customers/clients and organization (corporate) image rating. On this viewpoint, RA1 commented, "*Our company is a client oriented*

organization since we focus heavily on meeting the requirements and needs of clients. So, definitely client satisfaction is a high priority to us". In addition, RA4 stated, "*Another good indicator that we use to assess our performance is the percentage of repeat clientele. Currently, it is about 60% on average and our aim is to work towards improving on this".* Moreover, in explaining the importance of corporate image as an important strategic measure of customer performance in Case A, RA6 stated:

> Recently, there has been some emphasis on strengthening the company's image and branding. This is because branding and establishing a good image are important attributes that would improve the performance and competitive advantage of the company in this dynamic environment. In addition, the branding of the company is centred on the owner, managing director (CEO). And if for example, something goes wrong with the owner, then this can affect the whole company's image and performance.

The above quotation indicates that Case A appears to be managing its brand strategy around two cornerstones: customer focus and corporate leadership (CEO reputation). Essentially, its customer focus would be based on differentiation of its product and service offerings to customers or clients, while corporate leadership (CEO reputation) would convey its reputation for business excellence and mutual beneficial relationships, extensive business experience in this industry and hands-on approach to business management.

Evidence shows that Case A was moderately using customer or client growth to assess its performance. On the other hand, the application of percentage of market share by Case A was very limited. This may due the assumption that it is one of the industry leaders and thereby paying little attention to monitor market share as an important performance measure. Table 5.5 shows the frequency of mentions of the interviews regarding customer perspective of Case A.

Table 5.5 Frequency of mentions of measures in the customer perspective of Case A

Customer performance measure	**Mentioned by**
Customer or client satisfaction rating	RA1, RA2 RA3, RA4, RA5, RA6, RA7=7
Number of complaints from customers	0
Number of new customers/clients	RA1, RA3, RA4, RA5, RA6, RA7=6
Customer or client growth	RA3,RA4, RA6=3
Number of customer improvement suggestions	0
Percentage of repeat customers/clients	RA1, RA2 RA3, RA4, RA5, RA6, RA7=7
Percentage of market share	RA4, RA6=2
Organization (corporate) image rating	RA1, RA2, RA3, RA4, RA6=5

5.2.2.1.3 Internal business process perspective

The frequency of mentions of performance measures of the internal business process perspective by the interviewees of Case A is presented in Table 5.6. According to results from the interviewees and document analysis, the most widely adopted performance measure within the internal business process perspective of the Case A was response time to key quality and/or other business issues. The following quotation illustrates this viewpoint: "Our *priority is to constantly monitor and improve response time and processing time within the operations of the company"* (RA4). Similarly, RA6 stated, "*Response time is pertinent to us because regulators and clients regularly set targets for us meet".*

The other commonly adopted internal business process measures include level of defects or errors, processing time, level of risk (and safety) and risk management responses. The majority of the interviewees suggested that Case A places considerable emphasis on the importance of monitoring the level of error or defects to ensure the delivery of quality products and services to customers. The operations duty manager (RA1) in the following quotation expressed this view:

> Also, the level of errors and defects is a critical measure for us. [….] we are actually monitoring it very closely. We are constantly reviewing our operations to ensure that processing time and defect levels are within acceptable levels to deliver high quality products and services to our clients. As you know, high quality products and services can increase the level of customer satisfaction (RA1).

The interviewees emphasized the importance of identifying and measuring risks. In this regard, RA6 suggested, "*We try to understand the risk issues that confront our company such as the market competition. As such, we would identify and quantify the critical individual risks that may come our way and then try to respond appropriately in order to bring them to acceptable levels".*

Meanwhile, the interviewees identified some relevant ways of responding to identified risks issues of Case A. In so doing, RA3 suggested:

> […] We usually identify and assess our potential exposure to risks and then try to respond to them. Some of the appropriate measures that we would utilize for responding to our risks include insurance coverage, employing sufficient competent staff, regulatory compliance, and managing our core internal processes well.

Furthermore, RA5 commented:

> Recently we have increased emphasis on safety throughout the company. More so, we are managing the level of safety in our plant site, especially the workers who work directly in the production area where there is a high level of dust and other hazards. Our plant workers are provided with safety equipment such as respirators and mass, and are encouraged to comply with safety policies.

In the same vein, RA6 added:

> Now, we are placing high priority on health and safety at the workplace. For example, we have insured our workers and property. We try to ensure that every one works in a safe working environment. We are also emphasizing to our workers the importance of health and safety and in particular their appropriate safety behaviours. […] in support of the increased emphasis of health and safety at the workplace, we provide the workers the necessary health and safety equipment and tools to perform their work, we try to comply as much as possible with appropriate health and safety standards and regulation, we communicate health and safety concerns to them, etc.

Additionally, the Case evidence illustrates that tender success rate was a moderately important measure for Case A. This result is not surprising as Case A focuses attention on repeat business customer. This finding may suggest that Case A needs to improve on its business process to increase tender success rates from new clients. In contrast, construction productivity rate, accident level, the percentage of expenses to total sales (turnover) revenue, number of meetings, level of punctuality of deliveries, level of reliability of deliveries, and risk assessment review were among the least significant internal business process measures of Case A.

Evidence from both the interviews and document analysis shows that no consideration was given to safety & health audit, number of risk management meetings, and risk scores for core construction business activities to assess the internal business process performance of Case A.

Table 5.6 Frequency of mentions of measures in internal process perspectives of Case A

Internal business process measure	Mentioned by
Response time to key quality and/or other business issues	RA1, RA2 RA3, RA4, RA5, RA6, RA7=7
Level of defects or errors	RA3, RA4, RA2, RA5, RA6=5
Processing time	RA2, RA3, RA4, RA5, RA6=5
% of expenses to total sales (turnover) revenue	RA3, RA4=2
Tender success rate	RA2, RA3, RA4, RA6=4
Construction productivity rate (ratio of outputs to inputs)	RA2, RA5, RA6=3
Accident rate/level	RA5, RA6, RA7=3
Time lost to accidents	0
Safety & health audit	0
Number of risk management meetings	0
Risk management responses	RA2, RA3, RA4, RA5, RA6=5
Risk assessment review	RA6=1
Risk scores for core construction business activities	0
Level of risk (and safety).	RA1, RA2, RA3, RA4, RA5, RA6=6
Level of punctuality of deliveries	RA5=1
Level of Reliability of deliveries	RA5=1
Number of meetings	RA4, RA6=2

5.2.2.1.4 Learning and growth perspective

Table 5.7 presents the frequency of mentions of performance measures within the learning and growth perspective by the interviewees of Case A. According to the results of the interviews and document analysis, employee competency (skills) coverage ratio and investment in ICT in construction were the two most extensively used performance measures by Case A. These measures were given the highest priority among learning and growth performance measures maybe because the firm has recently invested in construction technologies to maintain a leadership position in the industry (RA1) and concomitantly tries to ensure that it workforce has the competencies necessary to deal with its growing needs of the construction markets (RA6).

Level of IT application in construction and training hours per employee per year were the other extensively used performance measures observed in the case evidence. During an interview, RA1made the following remark:

> Well, the level of IT application in our construction businesses is a prerequisite for us. Because everything that we do is centred on the use of technology, so having an appropriate level of IT application in construction is a big thing for us to utilize in improving our processes. […] very importantly, we invest and use technology to remain relevant and take the lead in the industry.

Commenting on the same viewpoint, RA2 indicated, "*We have embraced IT technologies in our company. In particular, the application of IT in our construction projects has help us to manage and deliver them more efficiently. We see what's on the market and select what is more appropriate to us".*

According to evidence gathered in this case study, employee satisfaction, employee productivity, rewarding and recognizing of staff contributions, and percentage of employees using computers in construction and investment in knowledge management efforts were moderately used in Case A. Meanwhile, the least used learning and growth measure in Case A was employee absenteeism rate. During the interviews, some interviewees suggested that currently employee absenteeism rate is not a critical measure in Case A, but it should be given prominence in assessing the firm's performance in immediate future. In line with this viewpoint, RA2 emphasized:

> I have observed throughout the year that some key workers were absent from work for more than 2 days in a period work. I believe it would materially increase the cost of labour in the company if this trend continues. Therefore, this kind of issue should not be ignored because it may also be a bigger problem of employees' morale and motivation. I believe in this context we need to keep track of number of days lost through absenteeism in the company.

Evidence shows that Case A has recently improved its employee absenteeism policies and procedures. For example, RA6 noted, "*Well, we have dedicated a senior staff to monitor our employee absenteeism, who have updated our procedures and policies for employee absenteeism. So we are expecting to see an improvement in these areas in the immediate future".*

There is no empirical evidence available for supporting investment in leadership development and percentage of employee with degrees as important measures of performance in Case A. It was a little surprising that Case A did not give due consideration to leadership development as a critical performance measure for the firm. This may imply that Case A has not invested much in leadership development programs as a means of increasing leadership effectiveness in directing the company and meeting its challenges in this rapidly changing business environment. Furthermore, number of employee improvement suggestions was perceived as a least important measure. This may imply that Case A may not have a proper system for capturing improvement suggestions from employees, which are essential for service and product improvements and innovation.

Table 5.7 Frequency of mentions of measures in the learning & growth perspective of Case A

Learning & growth measure	Mentioned by
Employee satisfaction rating	RA1, RA2, RA3, RA6=4
% of employee with degrees	0
Training hours per employee per year	RA1, RA2, RA5, RA6, RA7=5
Employee productivity rate (Output per employee)	RA1, RA4, RA5, RA6=4
Employee absenteeism rate	RA6=1
Recognizing & rewarding employee for outstanding performance	RA1, RA3, RA5, RA6=4
# of employee improvement suggestions	0
Employee competency (skills) coverage ratio	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Investment in leadership development	0
Investment in Knowledge management efforts	RA6=1
Level of IT application in construction	RA1, RA2, RA3, RA4, RA6, RA7=6
Investment in IT in construction	RA1, RA2, RA3, RA4 RA5, RA6, RA7=7
% of employees using computers in construction	RA1, RA3, RA4=3
Staff turnover	RA7=1

5.2.2.1.5 Supplier perspective

Table 5.8 shows the frequency of mentions of measures within the supplier perspective by the interviewees of Case A. Strong evidence from the case study suggests that supplier performance of Case A is mainly assessed using percentage of on-time supplier deliveries, level of supplier's defect-free deliveries and level of contract compliance. RA1 stated, "*Well, we definitely check and closely monitor deliveries from our suppliers to ensure that they are defect-free".* RA6 stated that, "*We work well with our suppliers to ensure they deliver on time and defect free goods or services to us".* Furthermore, RA6 further pointed out, "*You know, the industry is plagued with allot of contractual disputes. Therefore, we would monitor our contractual arrangements with our contractors, sub-contractors and other suppliers carefully to ensure adherence by all parties".*

The level of supplier satisfaction, level of supplier's flexibility and supplier relationship were among the moderately used supplier performance measures of Case A. Furthermore, the case findings indicate that Case A uses strategic alliances and business and relationship networks to build and maintain strong buyer-supplier relationships. Meanwhile, Case A rarely considers supplier lead-time against industry norm and number of innovative suggestions from suppliers as important supplier performance measures.

Table 5.8 frequency of mentions of measures within supplier perspectives of Case A

Supplier performance measure	Mentioned by
Level of supplier's defect-free deliveries	RA1, RA2, RA3, RA4, RA5, , RA6=6
Percentage of on-time supplier deliveries	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Supplier lead time against industry norm	0
Level of supplier satisfaction	RA3, RA4, RA6=3
Level of flexibility	RA1, RA3, RA7=3
Number of innovative suggestions from suppliers	0
Level of contract compliance	*RA2, RA3, RA5, RA6, RA7=5*
Level of supplier relationship	*RA4, RA5=2*

5.2.2.1.6 Project perspective

Table 5.9 shows the frequency of mentions of performance measures within the project perspective by the interviewees of Case A. The overall results show that quality of workmanship and product, client's satisfaction and level of project safety were the most extensively used performance measures by Case A. For example, RA1 commented on quality of workmanship and stated:

> Quality of workmanship and finished products as well as the satisfaction of our clients are very important aspects of evaluating the success of our construction projects. You know, dissatisfaction is mainly expressed by clients when poor quality finished products are delivered to them. So, we strive hard to effectively manage our projects so that they can deliver good quality finished products that would satisfy our clients.

As noted by RA2, *"Monitoring the level of safety in our projects is critically important to us. Because not following important safety requirements would negatively affect the progress of our projects in terms of delays, cost overruns, etc."* In a similar vein, RA1 stated:

> Another key measure for our projects is the level of project safety. Now, more than ever before, we look at the level of safety within our projects very closely in order to manage the inherent risks associated with unsafe practices. This is important because workers have to feel safe and comfortable in working on our construction sites.

Strong evidence reveals that Case A has recently updated its safety procedures and practices, especially at the project level. Some of the key safety procedures and practices adopted by the Case A for achieving safety performance improvement include inter alia:

- Installation of additional signage and fire extinguishers;
- Strengthen compliance with national safety standards and regulations and best practices;
- Enforcement of appropriate safety policies such as ensuring that workers on construction sites wear protective equipment such as helmets and protective shoes where necessary;

- Assigning a safety supervisor on each project site;
- Provided safety training to site workers to improve their safety skills and awareness;
- Enhancing the layouts on project sites; and
- Update disaster emergency plans and business continuity plan.

In addition, time of delivery against agreed standards, project profit margin and actual cost Vs budgeted costs were other widely used measures for evaluating the firm's project performance. On the other hand, the case evident revealed that Case A moderately used project productivity rate to its project performance. This might indicate that data to calculate this productivity measure seems to be difficult to collect. Meanwhile, functionality was a new theme that emerged from the case data and was the least used measure by Case A to evaluate its project performance. This may be because functionality, which is process of assessing the proper functioning of project outputs, is often perceived as a requirement of the quantity of workmanship and final products.

Table 5.9 Frequency of mentions of measures within the project perspective of Case A

Project performance measure	**Mentioned by**
Time of delivery against agreed standards	RA1, RA2, RA3, RA4, RA5, RA7=6
Actual costs vs Budgeted costs	RA1, RA3, RA4, RA7=4
Quality of workmanship and product (e.g. level of defects or errors)	RA1, RA2, RA3, RA4, RA5, RA6 RA7=7
Project profit margin	RA1, RA3, RA4, RA6 RA7=5
Project productivity rate	RA1, RA2, RA3, RA7=4
Client satisfaction rating of project	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Level of project safety & risks	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Functionality	RA2, RA7=2

5.2.2.1.7 Environment and community perspective

Table 5.10 shows the frequency of mentions of measures within the environment and community (Env & com.) perspective by the interviewees. With this respect perspective, the three most widely used performance measures identified from the case evidence were level of environmental compliance, the number of jobs created and contribution to the local community. It was not surprising that case study revealed strong case evidence for environmental compliance as a high priority measure since it is part of corporate social responsibility. Environmental compliance was

also widely discussed in the interviews. Some of the relevant comments from the interviews include:

> One of the good thing I can tell you is that we are interested about the number of jobs we create. Environmental compliance is also critical, as there is a growing environmental awareness among our customers and other stakeholders. Furthermore, we contribution to some extent to the local community (RA1).

> We do contribute to the development of the local community and Saint Lucia as a whole by creating jobs and providing donations to charitable and non-profit organizations. Further, we take environmental compliance and issues very seriously into consideration because non-compliance can prevent us from realizing some of our key objectives. I know we are currently stepping up our efforts to ensure that we achieve higher levels of environmental compliance in the company (RA6).

> I know that we give high priority to meeting or exceeding environmental laws and regulations. For example, we are making use of environmental technologies such as modernized air and pollution control systems to minimize environmental pollution caused by our construction activities (RA2).

> We are highly considering environmental issues and practices within our operations. We are also actively monitoring environmental issues and compliance by deploying best industry practices, technologies and international standards. […] We have installed adequate dust monitoring devises at various points within the site to capture any dust emitted in the environment and to measure the air quality. Further, we have adopted relevant aspects of ISO standards for quality management and environmental management in our operations, which I know is not a government environmental requirement for construction companies in Saint Lucia (RA7).

The above quote signifies that Case A is not only attempting to comply with national laws and regulations but also adopting international standards and best practices to improve on its environmental performance. This may further suggest that Case A is trying to position itself in the marketplace as an environmentally responsible company.

The case study offered limited evidence that supports wastage level, energy consumption and water consumption as frequently used measures by the Case A in evaluating its environmental performance. One site manager (SA7) noted: "*We are regularly monitoring our fuel consumption on the site in order to improve on its efficiency"*. Conversely, one interviewee suggested that

monitoring water consumption appears to be a low priority measure in the firm although water consumption is usually perceived as a cost significant in construction.

Table 5.10 Frequency of mentions of measures in Env. & com. perspective of Case A

Environment & community measure	Mentioned by
Level of environmental compliance	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Energy consumption	RA1, RA7=2
Water consumption	0
wastage and scrap rate/level	RA5, RA7=2
Number of jobs created	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Contribution to the local community	RA1, RA2, RA3, RA4, RA6=5

5.2.2.1.8 Objective 2: identifying CSFs of Case A

Table 5.11 summarises the frequency of mentions of CSFs by respondents of Case A, which is used to support the case findings. The CSFs were clustered within the seven performance perspectives original identified from the literature. The findings also revealed sub- CSFs for some CSFs. For example, quality management, conflict management, project risk management and leadership has been identified as the sub-CSFs for performance management (a CSF).

Evidence gathered from the interviews and document analysis shows that the nine most important CSFs for Case A include leadership, customer & client satisfaction, organizational competency, quality of service, project management, process management, resources availability and utilisation, financial stability and contract and procurement management. The case results afforded high priority to leadership is justifiable, as leadership is an important driver in construction. In view of this, RA5 commented,

> The most critical factor that contributes to our company success is strong and relentless leadership of the Managing Director. Another one is committed, competent and dedicated core staff that will go the extra mile when the need arises. In particular, we have well driven managers and supervisors who understand and implement the Managing Director's vision.

The above quote may suggest the Case A success has been coalesce around the visionary leadership of the managing director. Further, it emphasized that top management of Case A would

communicate the vision of the managing director to all employees at various hierarchical levels to gain commitment toward the attainment of goals and objectives. Furthermore, the chief executive officer (CEO) as visionary leader should adopted visionary strategies that incorporate the key values of the firm and consider all their views of all stakeholders and ultimately provide benefits to them. In the context of the case, RA1 believes that appropriate leadership style such as consultative leadership should be adopted within Case A to support improvement in organizational performance.

Similarly, RA2 indicated that: "*Well, the success and growth of the company are based on two main factors: leadership and the attitude of key staff towards work* (RA2). In addition, RA6 noted, "*An important CSF for this company is the availability and optimal utilisation of resources in terms of materials, HR and industrial equipment. The company has mostly all of the inputs to undertake a construction job or project for any client in Saint Lucia".*

The forgoing comments may imply that Case A has an increased emphasis on having sufficient resources and competences available to match the demands of the construction industry in Saint Lucia and to some extend the Eastern Caribbean. Whilst Case A appears to be adopting a resources based approach, it needs to play attention to over-investment or capitalization, which may lead to inefficient utilisation of resources.

Meanwhile, RA1 emphasizes the importance of customer satisfaction as an essential factor for the firm's success by stating:

> One of our critical success factors for example, is customer satisfaction. As a result, we have directed significant efforts in delivering quality products and services in order to satisfy our clients and customers. […] critically, our leaders are available to speak to everybody about their concerns of our products and services.

This above quote implies that the leadership of Case A attempts to remain close to the customers and clients as a means of obtaining feedback on product and service quality. It is expected that addressing the feedback would contribute towards improving the performance of Case A.

Regarding project management as a CSF, the case study provides further evidence regarding project success factors. Some key examples of project success factors include team leaders' competences and commitment, project team competences, availability of sufficient project resources, project participants' collaboration, team working and effective project monitoring and control. For example, RA4 emphasised, "*I know project management is also critical to the success of our projects and the company. Well, for project management, our team leader competences and vision, the technical skills of our project teams and availability of resources are some key elements used for our project success".*

RA5 claimed that, "*I think contract management is critical to the success of the company. So we are ensuring in as much as possible that all parties are complying with the terms and conditions of agreed contracts".* Meanwhile, document analysis indicates that Case A is using many standard forms of contract include The International Federation of Consulting Engineers (FIDIC), modified Jointed Contracts Tribunal Ltd (JCT) building contracts and simple building contracts. Furthermore, the emphasis of Case A would be to develop suitable contracts and effectively manage the contracting process to minimise contract risks.

The case study provided some evidence to show that the managers of Case A are using performance measures for IT technology competency, environmental sustainability, supplier management and profitability. It appears that there is growing awareness of environmental sustainability within Case A.

On the other hand, the Case A was limited in providing empirical evidence for employee learning and development, risk management, growth, integration of operations and processes among others as CSFs. From these results, it was surprising that business growth was no an important CSF since Case A has focused its efforts on expanding its capacity to propel growth. This may suggest that Case A has not established pre-determined targets for growth but may rely on proxy measures such as profitability as means of signalling value creation and growth. In emphasising integration of operations and processes as a CSF, RA6 stated,

> I believe that the integration of the company's operations and business processes has also contributed to its success. [...] Our focus has been on integrating our internal processes within company's whole value chain. Thus, integration would

enable the company to deliver quality products and services, and hence strengthened its competitive position in construction industry.

This above quote demonstrates that Case A needs to focus on integrating its business activities and processes to add value to the clients. Overall, low priority was given to integration of operations and process by interviewees as an important CSF.

Table 5.11 Frequency of mentions of CSFs of Case A

#	Perspective	Critical success factors	Mentioned by
1	Financial	Profitability	RA3, RA7=2
		Liquidity	RA3=1
		Growth	RA3=1
		Stability	RA1, RA3, RA4, RA5, RA7=5
2	Customer	Client or customer satisfaction	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
		Client relationships	RA1=1
		Client acquisition/retention	RA3, RA4=2
3	Internal business processes	Quality of service/product	RA1, RA3, RA4, RA5, RA6, RA7=6
		Risk management	RA3=1
		Process management	RA3, RA2, RA5, RA6, RA7=5
		Maintenance management	RA5=1
		Communication	
		Resource availability and utilisation	RA1, RA3, RA4, RA5, RA7=5
		Integration of operations& processes	RA6=1
4	Learning and growth	Employee learning & development	RA6=1
		Organizational competency:- Employee competencies and skills; Top management competencies; Other work related competencies	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
		IT Technology competency	RA1, RA4, RA7=3
		Leadership	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
		Job security	RA1, RA6=2
5	Supplier	Supplier management - Supplier relationships	RA1, RA3, RA4, RA6=4
		Procurement/contract management	RA1, RA2, RA3, RA5, RA7=5
6	Project	Project management:- Quality management; Conflict management; Project risk management; leadership	RA1, RA2, RA3, RA4, RA5, RA7=6
7	Environment and community	Sustainability	RA4, RA6, RA7=3

5.2.2.2 Objective 2: Target setting for performance measures

In the context of case A, the evidence from the interviews and document analysis shows that managers set targets for some of its key performance measures and can monitor the effectiveness of achieving these targets. Moreover, all the respondents indicated that Case A sets performance

targets for its performance measures. This would allow Case A to measure, monitor and report its performance and objectives against established performance targets. Evidence from document analysis provided examples of key performance measures for which targets are set in Case A. They include inter alia profit margins, return on investment, defect rates, repeat clientele, successful bids, and percentage of on-time deliveries. RA4 illustrated the importance of setting effective performance targets by noting, *"In our company, targets are important to set because they can tell us how well it is doing against its plans and they can be set for improvement".* In addition, RA5 noted, "*For our key performance measures, we try to set realistic targets and continually monitor their achievements against those measures".*

5.2.2.3 Objective 2 uses of performance measures by Case A

5.2.2.3.1 Measure performance use

Table 5.12 shows the frequency of mentions of measure performances use of Case A by the interviewees. From the findings of the interviews and document analysis, monitoring progress towards achieving objectives and evaluating performance were the most significant use of performance measures for the Case A. Furthermore, performance measures of Case A were used to a limited extent for learning existing work practices.

Table 5.12 Frequency of mentions of the measure performance use of performance measures

Measure performance	**Mentioned by**
Monitoring progress towards achieving objectives	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Evaluating performance	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Learning existing work practices	RA4, RA6=2

5.2.2.3.2 Strategic management use

Table 5.13 presents the frequency of mentions of the strategy management use of performance measures by interviewees of Case A. According the case results, the most important uses of performance measures from the strategy management use category include strategic decision-making, focusing attention on strategic aspects of business, strategic planning, strategy

implementation, managing strategic problems, and marketing. This imply that strategy management appears to be an important aspect of Case A. The findings of the case show that strategic decision-making has the highest priority among the uses of performance measures within strategy management use category. This is not surprising as making good informed decisions can improve organizational performance. Some of the salient comments from the interviewees are as follows:

"We obtain information from our performance management system to help us with our decision-making" (RA4).

"I think we use our performance information to help us to set and execute strategic priorities of the company. Another use of our performance information from our system is to identify major problems so that we can then develop solutions for these problems" (RA6).

Some case evidence shows that Case A is using performance measures for managing strategic capabilities and strategic change. RA6 underscored the significant use of strategic capability by staying:

> I know our performance management system provides us with information on the capability and availability of our existing resources such as our labour, equipment, materials, capital, etc. Critical for the company is to have the right mix of resources and skills throughout any year to deliver quality work for the clients. Consequently, we recently expanded on our capabilities so that we can meet the growing needs of our clients and improve on our future performance.

This above quote may suggest that Case A is using information about its strategic capabilities to build its ability to respond to anticipated changes in the competitive business environment and increase its future competitiveness. RA5 suggested that:

> Well certainly, we are using our system to identify and made important changes in the company. We are now making allot of changes in our operations. For example, we are implementing a new safety improvement system to ensure that we comply with the safety regulations of government and improve on our safety performance.

The comments from RA5 may suggest that the firm is reactively implementing strategic changes driven from external forces such as regulatory pressures.

Furthermore, case evidence suggests that a huge rebranding was taking place that represented a major strategic change for the firm. Evidence further suggests that the rebranding effort is part of growth opportunities and reposition of the Case A in the marketplace to achieve success. As evidenced by the following quote: *"I strongly think that our rebranding initiative will make the company realize its planned changes and marketplace success"* (RA1).

An interesting finding from the Case A is that it has been using it performance measures for marketing. In the same vein, Case A has a business development and marketing department to monitoring its marketing performance. According to the Business Development Executive (RA4), "*I know we use our performance information to evaluate are marketing performance. As you know, we put allot of efforts and resources in marketing and branding and we want to know the returns on our spending".* Most of the interviewees suggested that marketing and branding are good mechanisms to increase the customer base of Case A.

Generally, challenging strategic assumptions is seen as way of bring about innovation and improvement to a firm's business models. However, no evidence emerged from the case study to show that challenging strategic assumptions is an important usage of performance measure of the firm. This may imply that using information from performance measures to challenge keys assumptions and strategies is not part of the firm's culture.

Table 5.13 Frequency of mentions of the strategy management use of measures of Case A

Strategy management	**Mentioned by**
Strategic planning (formulation)	RA1, RA2, RA3, RA4, RA6=5
Strategy implementation/execution	RA1, RA2, RA3, RA4, RA6=5
Focusing attention on strategic aspects of business	RA1, RA2, RA4, RA5 RA6, RA7=6
Strategic decision making	RA1, RA2, RA3, RA4, RA5 RA6, RA7=7
Managing strategic capabilities	RA1, RA6=2
Managing strategic change	RA1, RA5, RA6 =3
Challenging strategic assumptions	0
Managing/solving strategic problems	RA1, RA2, RA5, RA6, RA7=5
Marketing	RA1, RA2, RA3, RA4, RA6=5

5.2.2.3.3 Communication use

The frequency of mentions of communication use of performance measures by respondents from Case A is shown in Table 5.14. Within this use category, performance measures of the Case A

were extensively used for internal and external communications, and communicating compliances with regulations to regulators. RA1 stated that*:*

> I think our systems generate important information, which is communicated to staff who responsible for taking actions as well as to other key stakeholders including government. So, for example, even in our staff appraisal we would go on to communicate to staff the critical aspects of their performance as well as well the company's performance.

RA7 elaborated on the saliency of communicating regulatory compliance:

> The government actively regulates this site [quarry and mining site] because of the very nature of the activities we carry out there. So, we have to regularly communicate some of our performance information to the relevant government regulatory bodies as part of regulatory compliance. On some occasions, relevant government officials would come to the site to conduct verification tests, but unfortunately, they would delay in communicating the test results to us.

In the similar vein, the interview evidence emphasises that effective communication between the Case A and government regulators can improve its regulatory performance as well as its overall performance. Meanwhile, communication between head office and divisions or SBUs within this category was perceived as the least use of performance measures of Case A.

Table 5.14 Frequency of mentions of communication use of measures of Case A

Communication	**Mentioned by**
Internal communication to management & employees at all levels	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
External communication to other stakeholders	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Benchmarking (comparing) with other firms	RA1=1
Compliance with regulations to regulators	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Communication between head office and divisions	0

5.2.2.3.4 Influence behaviour use

Table 5.15 shows the frequency of mentions of influencing behaviour of performance measures by respondents from Case A. According to the case evidence derived from both interviews and document analysis, performance measures influence behavior of managers and employees within Case A. In support of this viewpoint, RA6 emphasised *"I can say that we make use of our performance information to foster appropriate behaviours among our staff in order to achieve our desirable outcomes".* Furthermore, the interview findings highlighted some critical negative

behavioural consequences on performance of Case A. They include inter alia interpersonal conflicts among staff, workers resistances and role conflict.

More specifically, performance measures of Case A are most extensively used for cooperation and coordination, monitoring behaviour and managing relationships within influence behaviour use category. These findings are not surprising as it is critical that construction firms coordinate their business activities as well as monitor the behaviours of staff consistent with their goals and objectives. In addition, RA2 noted, "*As you may know, poor behaviour among staff can have negative consequences on the performance of our projects and the whole firm. Therefore, we have directed allot of efforts to the development and monitoring of the behaviours of our workers towards accomplishing the firm's success".*

Case A's extensive use of performance measures for managing relationships may imply that its managers have a clear understanding of the value of intrafirm relationships and inter-firm relationships. Consequently, managers would continuously respect and monitor relationships with key stakeholders to successful attain the firm's strategies and goals. This following quote signifies this viewpoint: *"I think we have useful performance information that would allow us to monitor our relationships with our employee, clients and other key stakeholders. Accordingly, we would maintain those relationships that are mutually beneficial to us"* (RA1). This implies that Case A seems to focus those relationships that would enhance its performance.

Some case evidence suggested that Case A uses its performance measures for role understanding. This may imply that Case A needs to improve on this area because when organizational members understand their role requirements and expectations then role conflict and ambiguity would be minimized.

Conversely, managers of Case A are using performance measures to a less extent for rewarding or compensating behaviour, staff turnover management and motivation of organizational members. However, RA 6 emphasises the importance of staff turnover management during the interview by stating, "*Staff turnover management a very important use of our performance information. So we*

constantly monitor staff turnover to ensure that we have adequate skilled staff at all levels to meet the company's objectives".

Table 5.15 Frequency of mentions of influence behavior use of measures of Case A

Influence behaviour	**Mentioned by**
Monitoring behaviour via performance appraisal	RA1, RA2, RA3, RA4, RA6=5
Motivation of organizational members	0
Role understanding	RA5, RA6, RA7=3
Cooperation and coordination	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Rewarding or compensating behaviour	RA1=1
Managing relationships	RA1, RA2, RA5 RA6, RA7=5
Staff turnover management	RA6=1

5.2.2.3.5 Learning and improvement use

At Case A, performance feedback information, performance improvement and managing firm's reputation are the three significant uses of performance measures within the learning and improvement usage category. Moreover, the interview results identify some key types of performance improvement use of performance measures such as quality improvement, process improvement and project management improvement.

Furthermore, the case results reveal that performance measures in Case A are sometimes used for high level learning and enhancing accountability. Regarding high-level learning, RA7 suggested,

> As you know, we are operating in a highly uncertain environment so we make use of our performance information for high-level learning. Very importantly, we use our information to help us to be adaptable, responsive and innovative in our management practices since we are involved on complex construction projects.

This can imply that Case A is leveraging high-level learning in project management, which in turn may lead to project success. Furthermore, the case evidence provided little evidence regarding the use of performance measures for benchmarking practices. This may imply that the Case A has not recognized the importance of benchmarking practices as a means of facilitating performance improvement and learning.

The frequency of mentions of learning and improvement use of performance measures by respondents from Case A is presented in Table 5.16.

Table 5.16 Frequency of mentions of learning and improvement use of measures of Case A

Learning and improvement	Mentioned by
Performance feedback information	RA1, RA2, RA3 RA4, RA5, RA6, RA7=7
Double-loop (high level)learning	RA1, RA2, RA6=3
Performance improvement	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Improving firm's reputation	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Enhancing accountability	RA3, RA6=2
Benchmarking practices	0

5.2.2.3.6 Managing risk use

Table 5.16 summarises the frequency of mentions of managing risk use of performance measures of Case A. The case evidence shows that Case A is extensively using its performance measures for assessing and managing risks. Evidence from document analysis shows that Case A is using risk registers, risk information sheets and health and safety forms to record and track its risks. Moreover, the two prominent uses of performance measures within the managing risk use category are project risk and operational risk.

In particular, interviewed managers provided much discussion on project risk. In this regard, RA2 indicated, "*Our performance [management] system captures risk information on our construction projects. This information allows us to manage the risks of our projects efficiently*". Further, RA5 noted, *"Well, some of the activities we perform on this site's operations have the potential to increase risks. Therefore, we regularly monitoring our operations in order to identify and minimize operational risks".*

Moreover, some of the interviewees claimed that the Case A pays particular attention to procurement and contract management, its availability of resources and competences, and collaboration between the project participants in managing its project risks. Some interviewees suggested that there is a need for staff members who are directly involved in projects to gain a better understanding of key aspects of project risk, which is crucial for project and organizational success. On the other hand, Case A sometimes use performance measures for financial and strategic risks.

Table 5.17 Frequency of mentions of managing risk use of measures of Case A

Manage risks	Mentioned by
Strategic risk	RA1, RA3, RA6=3
Operational risk	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Financial risk	RA1, RA3, RA4=3
Project risk	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7

5.2.2.4 Objective 3 Development of performance measures used by Case A

Table 5.18 shows the sources used by Case A to develop its performance measures. Evidence gathered from the case study shows that the performance measures were mainly derived from the outcomes of strategy development process of Case A such as its mission and strategies or strategic plan. Moreover, the findings of the case interviews provided examples of relevant performance measures that were derived from strategy development process. In the same vein, RA1 suggested:

> Well, the mission of our company spoke to establishing good relationships with key stakeholders such as clients and customers. And maintaining good relationships is a critical source for retaining key employees, clients and customers. I think a key performance measure for good relationships could be percentage of repeat clientele.

Similarly, RA6 suggested that 'quality products and services' is a key aspect of the firm's mission and identified the level of responsiveness as an important performance measure for the aspect of quality. These comments from the interviewees may suggest that the interviewees have a common understanding of the development of the firm's performance measures from its strategy development process. This means that Case A might assessing progress towards the achievement of its mission and strategies.

Furthermore, case evidence shows that the performance measures of Case A were also derived from existing performance management frameworks such as construction industry KPIs and from industry standards such as International Standards Organization (ISO) quality standards and environmental standards. Evidence emerging from the case interview provided examples of performance measures that were developed from industry standards. They include regulatory compliance, waste, defeats, and quality of work.

The case findings provided strong evidence to show that managers of Case A are using CSFs to derive key performance measures. This imply that setting performance measures from CSFs would allow the Case A to measure and track its performance across all critical business activities over

time. The interview evidence suggests that developing performance measures from CSFs can help Case A to realize its strategies and objectives. This view was emphasised by a senior manager, "*It is essential for us to link performance measures to CSFs. This I think can enable our company to focus efforts in achieving its strategies* (RA4). Moreover, the interview evidence illustrated some examples of the firm's CSFs and their associated performance measures. For example, RA3 noted, "*We usually set performance measures for important CSFs. For example, customer satisfaction and customer retention are two important CSFs. The key measures that we are using to monitor these CSFs are the level of customer satisfaction and percentage of repeat clientele respectively".*

Table 5.18 Sources used by Case A to develop performance measures

Source	Mentioned by
Strategy development process	RA1, RA2, RA3, RA4, RA5, RA6 =6
Existing PMM frameworks	RA1, RA2, RA5, RA6, RA7=5
Industry standards	RA1, RA2, RA5, RA6, RA7=5
CSFs	RA1, RA2, RA3, RA4, RA5, RA6 =6

5.2.2.5 Objective 4 PMM frameworks used by Case A

The results of the interviews and document analysis suggested that Case A is using its own internal developed PMM framework to evaluate its business performance. In support of this view, RA1 suggested that rather than fully adopting the industry KPIs "*we are using our internal KPIs*".

Evidence indicates that Case A's PMM framework is operated from the Head office in the corporate department, which tries to obtain pertinent information on the performance of the different functions and projects throughout the organization. However, the PMM framework is to some extent integrated with other management systems at the corporate office but not across the different SBUs and projects. During the interview, the financial controller (RA3) indicated that Case A does not have a fully structured and integrated PMM framework like the BSC but its PMM framework contains some key aspects of commonly used CPMM frameworks. RA3 further stated that Case A's PMM framework contains an accounting system within the finance and accounting department, which is used for measuring and reporting only financial performance and other management systems in other SBUs which provide information on some non-performance as well as financial performance.

Besides the accounting system, other important management systems at the corporate office include HRM system, which mainly focuses on staff appraisal performance and reward, and recruitment and selection; an electronic point of sales system to track sales and inventories; business development and marketing system, which focuses on customers, sales (turnover), and markets, and project management (planning) system. Meanwhile, other management systems at the non-corporate departments and projects include project management system, safety performance improvement system and site management systems.

The above evidence may confirm that separate functional departments or silos have their own internal PMM framework with some integration to other management systems. This also reflects weak integration between the strategic level and operational level of Case A. The significance of an integrated and holistic approach to PMM was highlighted by RA3, who stated, "*I believe that our accounting system can be a significant platform to connect the various other control systems that we have within the company in order to develop a companywide integrated performance management system"*.

The case study provided little evidence to show that Case A is using a CPMM framework like BSC or performance prism. However, some interviewees also commented on the importance of CPMM frameworks such as the BSC to Case A in terms of aiding the achievement of organizational performance improvements.

5.2.2.6 Objective 5 Barriers to and strategies for CPMM framework implementation

5.2.2.6.1 Internal barriers to a CPMM framework implementation for Case A

Table 5.19 depicts the frequency of mentions of barriers to the successful implementation of a CPMM framework by respondents of Case A. According to the results of case study, inappropriate organizational culture, resistance to change, lack of knowledge and understanding of the concept of PMM, lack of understanding of the expected benefits from a CPMM framework and staff complacency were considered as the most significant internal barriers to the successful implementation of a CPMM framework within case A.

Regarding inappropriate organizational culture, the interview results identify two main sub-cultures that are sub-barriers to CPMM framework implementation as follows: (1) culture of the construction industry, which falls in the state of inertia in accepting change and (2) professional cultures, which encapsulates different professionals' views and opinions on PMM.

Some relevant comments from the interviews are summarised as follows:

> It is difficult to accept changes, because old habits die hard, so culture is a big barrier to the implementation of any new performance improvement system in this company. I can also say that some key workers are stuck in their comfort zone, and would definitely resist change, which is also a barrier (RA5).

> In term of the successful implementation of a new performance management framework, I think one of the major barriers is the lack of awareness and understanding of performance management within the company as well as across the industry (RA6).

> I believe staff complacency will be a major barrier. I have noticed that the company has achieved success over the years in the industry and I think this may have caused some key staff to become complacent, especially when considering the implementation of a new system (RA2).

This comment from RA2 could imply that some key staff (managers) have been pre-occupied with notion of entrapment of the previous success of Case A rather than the current and future performance. This could be detrimental to the long-term development of Case A.

There was some case evidence that indicated high implementation costs is an internal barrier to the successful implementation of a CPMM framework within Case A. Some interviewed managers suggested that the implementation of a CPMM framework will involve high costs and believed that the high initial costs of implementing a CPMM framework would outweigh its benefits. For example, RA6 suggested:

> All development initiatives such as the implementation of a PMM system definitely require financial investment. The objective is to obtain a return on each investment. I believe the high initial costs of implementation will create doubt in terms of securing a return on the implementation of a PMM system and therefore could be viewed as key barrier.

The case provided only limited empirical evidence for lack of top management support, firm size, and lack of employees' involvement and participation as important barriers to the implementation of a CPMM framework within Case A. Surprisingly, lack of top management support was not a major barrier to the implementation of a CPMM framework within Case A. This barrier was highly emphasized in the literature.

5.2.2.6.2 External barriers to a CPMM framework implementation for Case A

On the other hand, strong case evidence indicated that the most significant external barrier that would inhibit the adoption of a CPMM framework in the Case A was political uncertainty. Meanwhile, the case study provides some empirical evidence to support legislation and regulation in the industry as an external barrier. More specifically, some of the interviewees perceived that the recent change in government in Saint Lucia would lead to regulatory and policy changes that may generate uncertainties among construction firms in the industry. They further believed that given the political uncertainty caused by the recent change in government, the Case A would not implement any new management systems, unless mandated by regulators.

Furthermore, there was little case evidence to illustrate that the competition level and economic downturn/uncertainty are major barriers to the successful implementation of a CPMM framework. Conversely, the case study provided no evidence that suggested reluctance to adoption of new technologies and social and ecological uncertainties were important barriers to the implementation of a CPMM framework in Case A.

Table 5.19 Frequency of mentions of implementation barriers

Barriers to the implementation of a CPMM framework	**Mentioned**
Internal factors	
Lack of top management support	RA5=1

Lack of employees' involvement & participation	RA4=1
Lack of knowledge & understanding of the concept of PMM	RA1, RA2, RA4, RA3, RA5, RA6 =6
Ambiguity or lack of understanding of the expected benefits from CPMMF	RA1, RA2, RA3, RA5, RA6=5
Higher implementation costs	RA4, RA5, RA6, RA7=4
Inadequate resources for CPMMF implementation	0
Inadequacy of appropriate IT infrastructure support	0
Lack of clear strategies &/or strategic alignment	0
Business/firm size	RA1=1
Inappropriate organizational culture	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Lack of reward & incentive system for workers	RA6=1
Staff complacency	RA3, RA2, RA3, RA5, RA6=6
Insufficient/Lack of time to the implementation process	RA3=1
Poor communication practices/lack of effective communication	0
lack of coordination between departments	0
Resistance to change	RA1, RA2, RA3, RA5, RA6, RA7=6
Leadership/management styles	0
Inappropriate organizational structure	RA3=1
External factors	
Level of competition	RA4
Legislation & regulation in the industry	RA5, RA4, RA7=3
Reluctance to adopting new technologies	0
Economic downturn/uncertainty	RA4, RA7=2
Political uncertainty	RA1, RA3, RA5, RA6, RA7=5
Social & ecological uncertainties	0

5.2.2.6.3 Strategies for the implementation of o a CPMM framework in Case A

Table 5.20 summarises the frequency of mentions of strategies to overcome the barriers to the successful implementation of a CPMM framework by respondents of Case A. The results of the interviews and document analysis indicate that education and training, and a supportive culture for PMM within the Case A were the most important strategies that could be deployed to overcome barriers the successful implementation of a CPMM framework within it. Other important strategies revealed by the case evidence include leadership and top management commitment, gaining people's buy-in and involvement in the CPMM framework process and make PMM an integral part of strategic planning of the firm.

The interviewees suggested that education and training is vital for the successful CPMM framework implementation in order to provide management and staff with sufficient knowledge and awareness about PMM, to articulate the perceived net benefits of PMM and to help management and staff to embrace change in term of culture and management processes.

RA1 signalled the importance of a supportive organizational culture by stating:

> We must get people to be aware [of], and involve in performance management in the organization, and we must provide the culture for that. […] I have observed that we have one culture at the head office and an entire different culture on the construction sites. I think it is important for us to try to integrate these two cultures into a unified culture that supports performance management.

RA2 further added that staff must have the right attitude towards work and achieving excellence levels of performance to facilitate the successful implementation of a CPMM framework. The financial controller explained the importance of an appropriate culture, *"Fostering a strong performance management culture throughout the entire company is critical to any major system implementation in the company"* (RA3).

Regarding leadership and top management commitment, RA5 noted, "*The top will only support the implementation of the new [PMM] system if it is priority. For example, we are currently implementing a safety performance improvement programme because it was made a priority of company by the top management and may be regulators".*

Some evidence shows that aligning a CPMM framework with rewards as well as establishing a dedicated PMM team and allocated adequate resources were perceived as important strategies for the successful implementation of a CPMM framework in Case A. The low mentioned of these strategies may be because leadership and management commitment must first be established before pursuing them.

The case provides limited evidence to show that an appropriate ICT infrastructure, and increase accountability throughout the organization as important strategies for the CPMM framework implementation in Case A.

Table 5.20 Frequency of mentions of strategies for CPMM framework implementation

Strategies to overcome barriers to the implementation of a CPMM framework	Mentioned by
Leadership & top management support/commitment	RA2, RA4, RA5, RA6, RA7=5
Gaining people's buy-in and involvement in a CPMM framework process	RA1, RA2, RA4, RA6, RA7=5
Education & training	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
A supportive culture of PMM within the organization	RA1, RA2, RA3, RA4, RA5, RA6, RA7=7
Increase accountability throughout the organization	0
Aligning rewards to performance measures	RA1, RA3, RA5, RA6=4
Establishing a dedicated PMM team and allocated resources	RA4, RA5
Appropriate ICT infrastructure	0
Making PMM an integral part of Firm's strategic planning	RA1, RA3, RA4, RA5, RA6=5
Clear organizational strategy and goals	0
Appropriate implementation plan	0

5.5.2.5 The need for PMM in the construction industry by Case A

Overall, the case study showed that there is a need for Saint Lucian construction firms to utilize a CPMM framework to better measure and manage their performance. In particular, the majority of the interviewees indicated that a CPMM framework is important and applicable to the Saint Lucian construction industry but its implementation could be a challenge.

The Case evidence revealed that a CPMM framework could be useful to Saint Lucian construction firms because it can provide guidelines for developing strategies and policies in order to achieve improved performance. During the interview, RA1 suggested that taking into account project efficiency and effectiveness and environmental and community issues are vital for Case A to pave the way for benchmarking.

5.5.2.6 Recommendations for improvements in PMM practices

The results of the interviews and document analysis suggested that leadership and management of Case A should make CPMM a strategic priority to bring about improvement in its PMM practice. The evidence from case showed that improvements in PMM practices in the Saint Lucian construction firms could come about from the following:

- Increasing knowledge and understanding about PMM within the Saint Lucian construction industry;

- Greater focus on improving the workers' performance levels and productivity throughout the entire organization;
- Foster a strong performance management culture throughout the entire company;
- Implementation of a PMM framework that can be integrated of existing systems and tools;
- Greater linkage between performance and recognition and reward system;
- Greater work ethics and professionalism amongst construction workers;
- Establishing more suitable performance measures; and
- Greater focus on identifying processes across the various business units.

5.3 Case B

5.3.1 Contextual ground back of Case B

Case B is among the most influential construction firms in the Saint Lucian construction industry. It core business activities are construction engineering and infrastructure works, building and construction related professional services. It offers construction related products and services to both public and private clients in the domestic and Eastern Caribbean regional markets. Case B has been in existence in Saint Lucia for 15 years and currently employs 50 people. Case B operates from a head office and deploys employees to its construction sites. It has developed organically over the years. Case B is slowly moving from an entrepreneurial-based firm to a team-based firm where the teams have specialized functional responsibilities and are being more empowered to some extent.

5.3.1.1 Organizational purpose and identity

The vision and mission of Case B denote what it intends to become in the future and its basic purpose for existence respectively. Generally, the Managing Director articulates the vision of Case B. The firm envisioned to become a reputable and responsible construction and engineering firm in Saint and the wider Eastern Caribbean. This may suggest that Case B plans to build on its reputation of producing quality products and services for clients in the construction markets.

Furthermore, by seeing itself as responsible firm, it can be assumed that Case B plans to improve on its social and environmental responsibility.

Meanwhile, the mission of Case B is to grow and lead in the construction industry in Saint Lucia by meeting or exceeding customers, clients and societal expectations. This will be achieved by (1) demonstrating strong commitment to quality and customer satisfaction; (2) building a working environment, which respects, motivates, recognizes and rewards all employees; (3) utilising appropriate technologies and other resources; (4) building and maintaining a good relationship with stakeholders, and (5) team working. The interview results show that customer satisfaction is a key attribute of Case B's mission. The Human resource (HR) manager (RB6) expressed this sentiment in following quote: "*As I can see, satisfying clients and customers is the core of our mission. As a result, I believe our mission will trigger our employee to think constantly about our clients and customers and direct their efforts towards satisfying their needs".*

The case study results highlighted some strategic objectives that Case B uses to fulfil its vision and mission. They include:

1. To achieve acceptable profit margin on all contracts and works, and return on investment;
2. To maintain or improve client satisfaction;
3. To maintain or improve stakeholder relationships; and
4. To continuously improve business process, products and services.

It can be seen that the above strategic objectives of Case B tend are related to financial, customer and internal business processes perspectives. It is worthy to note that not all these strategic objectives have set targets and as a result, planning gaps (the difference between the target objectives and forecast results) for these objectives will not identified and quantified. Furthermore, Case B attempts to conduct its business operations in line with three core values namely, customers, quality and responsibility.

5.3.1.2 Governance and organizational structure

Case B has a Board of Directors that is responsibility for its governance and supporting its corporate strategies. In so doing, the Board will provide strategic guidance and direction, appoint

and effectively monitor management, be responsible for compliance with laws and statutory obligations, influence performance and ensure accountability to shareholders and other relevant stakeholders. The Board decide on ethical issues of Case B at three levels, namely national level, firm level and individual employee level in order to meet its goals and objective.

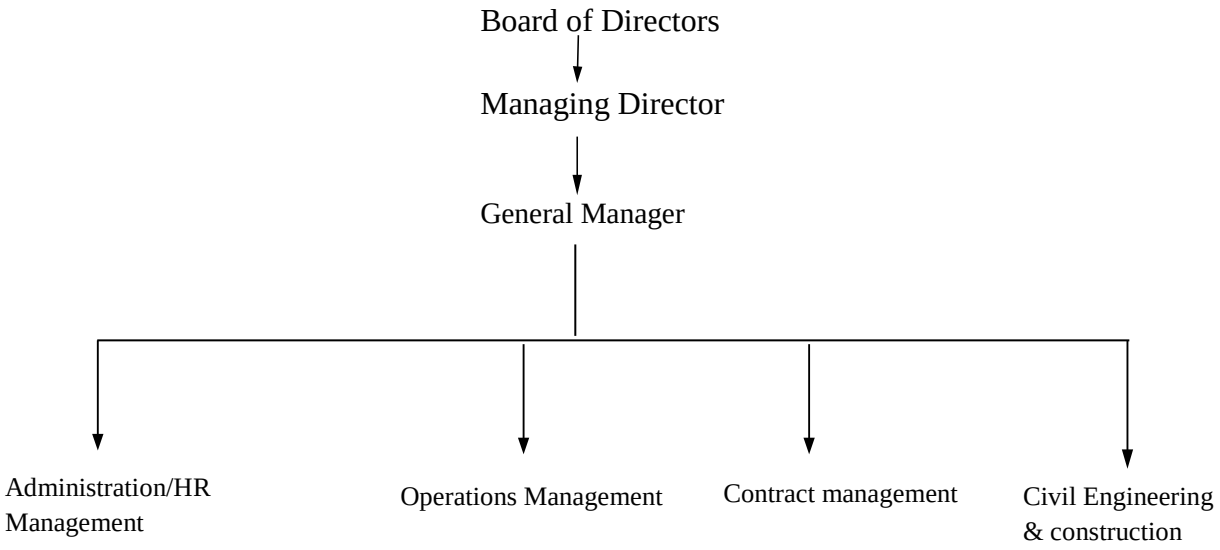
Case B has a traditional functional structure to support its business activities and strategies. This structure seems to be appropriate to Case B as it is a medium size firm that produces a range of products and services to only the construction industry (Wheelen and Hunger, 2012). Furthermore, functionalism seems to serve Case B well since it has technical skills and competences that give its competitive advantage in the marketplace. However, it may lead to an overreliance on departmentalism rather than business processes.

Case B clusters its employees and activities into relevant business functions and each business function reports to the general manager (see figure 5.2). It has four main business functions or departments, namely:

1. Administration and HRM department deals with recruitment and selection of staff, HR management and development, staff protection and performance, and accounting and finance;
2. Operations management department deals with purchasing, warehousing, logistics and transportation of the firm. It also involves in managing and maintaining mainly non-current assets such as plant and equipment;
3. Contract management department is responsible for contract planning, contract awarding, contract administration and contract closeout.
4. Construction and engineering department undertakes activities relating to designing, engineering, construction, and project management.

Moreover, Case B plans to open a branch or an office in one of the Eastern Caribbean countries, which will be operating under the construction and engineering department. Each business functional unit has a manager. The Board of Directors and managing Director are responsible for coordinating and overseeing the activities of the functional areas. The General Manager is responsible for monitoring closely the performance of all business functional areas, whereas

functional managers are responsible for the day-to-day activities and pay particular attention to resolving issues and problems at operational level. Figure 7.1 represents the organization chart of Case B.



Organization structure of Case B

Figure 5.2 Organizational structure of Case B

5.3.1.3 Corporate strategies

Case B has a business plan that covers a three-year period and encapsulates its strategies, objectives, targets and priorities for achievements. The business plan of Case B shows its planned actions over the three years. Case B intends to translate its business plan into annual operational

plans and budgets to support tend documents, continuous improvement and other business objectives.

It appears that Case B has a middling competitive position and therefore is currently taking steps to strengthen its overall market position. The competitive strategy that Case B mainly adopts to improve its competitive position in the marketplace is cost leadership where it focuses on economy of scale and its 'experience curve effects' to lower cost and create greater value to clients and customers. Moreover, its corporate directional strategy is oriented mainly toward business growth such as growth in turnovers and profits. The growth strategy of Case B focuses on the concentration on its current product and services offerings in the construction industry, and expanding its current operations horizontally in both domestic and regional target markets. Case B tends to place emphasis on repeat business as well as winning new jobs to ensure its survival and growth in the construction markets. At the functional level, it has directed its strategies towards improving its business operations and processes. The following quote is an indication of the understanding of Case B competitive strategy and position.

> Well, we plan to increase our competitiveness and growth in the market by leveraging our resources to create economy of scale and lowering costs that would benefits our clients. Additionally, we plan to increase our presence and bid for more work in the regional construction markets. In this regard, our directors are currently in discussions with some key clients and players in the Eastern Caribbean region (RB6).

Because of the intensive competition in the home market, it appears that Case B is using geographic expansion as a key growth strategy to increase its profitability, turnover, and return on investment.

5.3.1.4 Corporate culture

Corporate culture in an important ingredient of Case B's organizational performance and effectiveness. Although it tries to strike a balance between adaptive culture and non-adaptive culture, it tends to lean towards a non-adaptive culture. Incrementalism, risk aversion, technical and rationalistic approaches seem to characterize the perceived culture of Case B, which may be in line with the culture of the Saint Lucian construction industry. Its HRM department has an important role to play in keeping corporate culture on its managerial agenda, motivating members

to focus on continuous improvement of their performance, and matching corporate culture with the internal and external requirement of the Case B. During an interview, HR manager (RB6) suggested that the Case B's corporate culture is associated with 'status quo and silo mentality', which is affecting the behaviour and attitude of its members towards high levels of performance.

5.3.1.5 Business models and its competitive aspects

Case B uses its business models mainly to create value for its customers and other stakeholders. The business models of Case B seem to be designs around its targeted business segments or fields of activities as such as infrastructure construction, and commercial and building construction. Design and construction business model and measurement model seem to be the two main business models adopted by Case B. In the same vein, Case B uses its business models to create business value and competitive advantage. Case B appears to have the following three competitive strengths:

1. **Construction project management and development** – Its competitive edge is based on its strong construction project development and management expertise. It has relied on deploying staff competencies, construction technologies, executing both complex and unique projects, and understanding the local market to maintain its strength in construction project development and management.
2. **Relationship management** - Case B has established strong relationships with clients, suppliers and sub-contractors in order to supply products and services of high quality in its construction markets to satisfy its clients. From the interviewees' viewpoints, Case B has managed its corporate reputation and image reasonably well, which are critical factors for achieving successful long-term relationships with stakeholders. Furthermore, the evidence from the case interviews revealed that building and nurturing relationships with stakeholders is viewed as a cornerstone for meeting Case B's quality improvement and cost reduction targets and ultimately achieving business success.
3. **Corporate social responsibility** – Case B tries to engage in socially responsible activities and be held accountable for its actions. Very important, it remains committed to complying with environment laws and regulations and conducting business with stakeholders ethically. In addition, it has supported community based environmental initiatives. Furthermore, top management is committed to building and maintaining good relationships

with its key stakeholders and the society as a whole as well as producing quality products and services to its clients.

5.3.1.6 Market and environment

Case B has been operating primarily in the Saint Lucian construction market. It presence in the Eastern Caribbean construction markets is small. Moreover, it will attempt to win new contracts or projects from the construction markets, which are aligned with its business models. The construction market in Saint Lucia is considered to be competitive and dynamic. In that regard, Case B plans to work with other players in the industry such as suppliers, consumers, governments to cope with the competitive construction markets and dealt with the other challenges emerging from the business environment. Furthermore, it tries to use its business models to respond to the changes in the construction environment.

5.3.1.7 Future development and growth

Case B intends to review its business models to enhance its competitiveness in the market by focusing on continuous improvement and innovation. In particular, interviewed managers viewed improvement in PMM practices as one of the best ways of meeting the local and regional construction demands and needs, meeting the demands for increased quality and client satisfaction in the industry and maintaining its competitiveness. Accordingly, the case findings showed that Case B has embarked on the following initiatives for business performance improvements: (1) Revised its business plan and operational plans; (2) Introduce new performance indicators/measures across the departments (business units); (3) Redefined its organizational structure and procedures, and business strategy; (4) Develop a new performance appraisal system to assess and manage the performance of staff; (5) Increase the usage of information and communication technology and other innovation to improve communication, and products and service delivery.

Furthermore, Case B also intends to develop a new website and improve its budgeting practices as part of its business performance improvement initiatives. During the course this study, Case B has not fully implemented these business development initiatives, but expects them to be completed

in the immediate future. The outcomes of these business development initiatives would include the following: improved profitability, productivity, return of investment and overall performance.

Furthermore, Case B plans to review its business continuity plan including the evaluation its risk and resilience and identify and adopting risk or mitigation measures to assess the identified risks.

5.3.2 Key findings of Case B by research objectives

The consolidated case evidence was gathered from the six (6) semi-structured interviews with managers of Case B and analysis of its relevant documents. The general demographics of interviewed managers are depicted in Table 5.21. The interviewed respondents had an average of 13 years of experience and at least a Bachelor's degree. Overall, the background information of the interviewed respondents supported the quality of responses and reliability of the case findings.

Table 5.21 Profile of respondents of Case B

Interviewee	Position	Professional background		Experience in construction
		Area	Qualification	
RB 1	General operations manager	Business Management	BSc	15 years
RB 2	Project coordinator	Technical and quality services	BSc	13 years
RB 3	Project designer	Project planning & designing services	BSc.	9 years
RB 4	Worksite operations managers	Technical and quality services	Diploma	16 years
RB 5	Engineer & project manager	Infrastructure engineering and construction management	Post graduate Diploma, BSC	25 years
RB 6	Human resource manager	Human Resources management	MBA, BSc.	6 years

5.3.2.1 Objective 2: performance measures being used by Case B

5.3.2.1.1 Financial perspective

Table 5.22 shows the frequency of mentions of measures under the financial perspective by interviewees of Case B. Strong evidence emerged from the case study indicated that Case B was extensively using six financial measures to evaluate its financial performance. They include cash flow level, profit margin, return on investment, level of receivables, the debt level and accounts

payable level. The case finding that cash flow level was the most highly emphasised financial measure is justified, as it is a popular measure of liquidity and ultimately an indicator of the financial health of any firm. An interviewed manager emphasized this viewpoint in the following quotation: "*Well, cash flow is a critical measure for the company. I can say that without adequate cash flows, the works on our projects will be delayed or stopped"* (RB5). Another senior manager (RB6) explained:

> Effectively managing cash flow levels is of great importance to our company. Generating sufficient cash flow levels from our business activities will ensure that company can survive and then grow in the market place. However, significant delays in payments from our clients, which we have experienced in the past, affect the level of our cash flows.

These above quotes imply that cash flow level was perceived as a means of reducing financial risk of the Case B in the dynamic and competitive construction markets.

According to the interview findings, the managers of Case B justified the relative importance of return of investment, in comparison with others financial measures, as means of evaluating the success of its investment policy and as a compensation for undertaking risks in the industry. For example, RB1 emphasized, "*I believe that return on investment is an essential measure for our company. It reflects the earning ability of our construction investments and businesses. […] We must try to achieve a healthy return on each of our investment".*

Moreover, Case B has recognized debt level as an essential means of evaluating its financial performance and in particular its long-term financial solvency. According to RB3, *"total debt levels should be a concern to any company. Well, given the rapid changes in the environment, I think we need to monitor and maintain reasonable debt levels in order to avoid difficulties in servicing our debts and ultimately project delays.* Furthermore, RB6 suggested that Case B has been financed by both equity and debt and as a result, management would need to strike a balance between them. RB6 further adds, *"High levels of debt reflects high loan interest payments which could affect the cash flows of the company".* These above comments may suggest that Case B is paying considerable attention in ensuring sustainable debt level and balancing its overall capital structure.

Meanwhile, RA6 noted, "*I think the level of [accounts] payable is a useful measure for us. And therefore we have to efficiently manage our payments to subcontractors and suppliers so that we can maintain a good business relationship with them".* This quote is suggesting that Case B is attempting to link the management of its payables to its business relationships.

There was limited case evidence to show that net profit growth rate, sales (turnover) growth rate and total assets growth are used for performance evaluation of Case B. This finding is contrary to its competitive strategy of business growth.

Table 5.22 Frequency of mentions of measures in the financial perspective of Case B

Financial performance measure	**Mention by**
Profit or Net profit margin (%)	RB1, RB2 RB3, RB4, RB5, RB6=6
Return on Investment	RB1, RB2 RB3, RB4, RB6=5
Current ratio (times)	0
Cash flow level	RB1, RB2 RB3, RB4, RB5, RB6=6
Receivables level	RB2 RB3, RB4, RA5, RB6=5
Sales (turnover) growth rate (%)	0
Net profit growth rate (%)	0
Level of debt (indebtedness)	RB2 RB3, RB4, RB6=4
Debt ratio - Total debt ÷ Total assets ratio (%)	0
Interest coverage ratio (times)	0
Total assets growth	RA2, RA5=2
Accounts payable levels	RB2 RB3, RB4, RB6=4

5.3.2.1.2 Customer perspective

Table 5.23 illustrates the frequency of mentions of performance measures under the customer perspective by the respondents of Case B. According to the case findings, Case B has been using five performance measures extensively to evaluate its customer performance. The five prominent measures include the level of customer satisfaction, level of repeat business from clients, number of new customers, customer growth and number of customer complaints. Some significant comments from the interviewees include:

> I have observed that we tend to focus on meeting the needs and expectations of our clients. I also think that when our clients are satisfied, we would know that our finished products have met their specifications. We also monitor repeated business from our existing clients. A high level of repeat business from our clients could suggest that they are happy and satisfied with our products. Therefore, it would be

> beneficial for us to maintain good as well as long-term relationships with our clients (RB3).

We can only succeed by getting new clients and keeping existing clients. We must meet their varying requirements to satisfy them (RB5).

Customer satisfaction level is a high priority for us. Well, I can tell you that customers do not forget or forgive bad experiences. So, we must try our best to meet their expectations and needs in order to keep them. Further, our satisfied customers can cause us to gain new customers (RB2).

> Number of new customers matters to us in this competitive marketplace. Recently we have made efforts to acquire new customers from our existing markets as well as new markets in the Eastern Caribbean. Although it has costed us a little more than retaining our existing customer base but overall I think, our revenues have improved (RB6).

> It is important to monitor and respond to customer complaints since they could signal that we need to improve our construction [processes] works and customer satisfaction level. I think we should try to make great use of customer complaints and suggestions to improve our processes and products. Very importantly, we should increase our efforts to address their complaints (RB2).

The case study provided evidence to demonstrate that corporate image and customer improvement suggestions were the least used customer performance measures of Case B. Notwithstanding the limited use of corporate image, some interviewees suggest that Case B needs to pay attention to its corporate image. The following quotation illustrates this view:

> I believe that we should not only rely mainly on word of mouth to communicate our successes and products and services in markets. But we need to engage in proactively marketing the company using a series a high profile successfully completed projects such construction of bridges, roads and other major infrastructure projects. This will allow the public to know about the company's successes and ultimately could improve its corporate image in the marketplace (RB1).

The above quote is suggesting that Case B needs to move from virtual marketing of its products and services to a proactive and plan marketing approach. Although customer suggestions was of little importance to Case B, RB3 emphasized it importance by stating, *"Customer suggestions is very important to bring about improvements at the design stage of our construction projects".*

Conversely, the case study provides no evidence to support percentage of market share as an important performance measure in evaluating Case B.

Table 5.23 Frequency of mentions of measures under the customer perspectives of Case B

Customer performance measure	Mentioned by
Customer or client satisfaction rating	RB1, RB2 RB3, RB4, RB5, RB6=6
Number of complaints from customers	RB2, RB5, RB6=3
Number of new customers/clients	RB2, RB3, RB5, RB6=4
Customer or client growth	RB2, RB3, RB4, RB6=4
Number of customer improvement suggestions	RB3, RB5=2
Percentage of repeat customers/clients	RB1, RB2 RB3, RB4, RB5, RB6=6
Percentage of market share	0
Organization (corporate) image rating	RB2 RB3, RB4=3

5.3.2.1.3 Internal business process perspective

Table 5.24 shows the frequency of mentions of performance measures under the internal business process perspective by interviewed respondents. The processing time, response time to business issues, tender success rate, defects or errors level, risk management response, and level of safety/risk were observed as the six (6) most extensively used performance measures within the internal business process perspective for performance evaluation of Case B. One of senior manager (RB5) stated:

> Our aim is to reduce processing time when we are performing tasks or operations on our sites. In so doing, we would either acquire or lease the relevant high-quality equipment to undertake tasks on site, especially on our large infrastructure projects. Yes, I can say that modern equipment and technology is of great benefit to us as it has improved efficiency in our operations and reduced labour costs. Well, you can see the small crew we have on the site.

The above quote suggests that Case B may be placing high emphasis on the use modern construction technology to undertake complex construction process on sites, to reduce cost, and hence improve current work practices. Evidence from the case study highlighted some factors affecting processing time in construction. For example, RB5 stated, *"sometime the efficiency gains that we have achieved from the use of modern equipment and technology could be lost because of other issues such as delays in supplying materials to the site and delays in responding to key issues or requests. I think we need to do better than that".*

Other significant comments regarding extensive use of internal business process performance measures in Case B are summarized as follows.

"*Monitoring the tender success rate is critical for our company. Typically, we bid for major construction projects that are being advertised by the governments and its agencies. […] winning tenders will be translated into more revenue and profit for the company"* (RB2).

> When I assign a task to a worker, I would check and document the amount of errors made in the task, and then ask the worker to take corrective action.[….] I believe that flagging errors promptly to workers will make them become more efficient in the immediate future. This will ensure we get the standard of quality of the products we need (RB6).

"In designing, we must thoroughly check our drawings and plans for errors to minimise change orders and additionally costs to the company. Like all designers, we try our best to provide drawings or plans with very few errors and omissions" (RB3).

The above comments from RB3 and RB6 emphasize the need to monitor the level of defect or error to ensure that Case B delivers quality products and services to its clients and increase the level of customer satisfaction.

Furthermore, the case findings provided some evidence that the number of meetings and the availability of equipment were relevant internal business process measure used for the performance evaluation of Case B. In commenting on the significance of the number of meetings, RB5 stated, *"Meetings should not be ignored in assessing the performance of our projects or the company. This is because a number of important meetings have taken place during the planning and implementation stages of our projects to discuss their progress, issues and performance improvements".* In the same vein, RB5 suggests that management needs to devote attention towards improving the documentation of the discussions and in particular, the decisions made at those meetings.

On the other hand, the case study provided limited evidence to suggest that productivity level, accident rate and number of risk management meetings were critical internal business process

measures of Case B. The limited importance of productivity level as an internal business process measure may be due to the difficulty in measuring productivity in construction. Although some evidence from the case interviews suggested that prominence should be given to the assessment of construction productivity in Case B. RA5 echoed similar view by stating, *"Productivity level is an important but challenging measure in construction projects. As a result, I think that we do not track and monitor productivity levels for our projects. [….] I believe there is room for us to improve on productivity by monitoring it closely".* In the same vein, another manager (RB2) stated, *"Often times, a job on site is taking longer than expected and we tend to cast a blind eye on that. I think we need to pay more attention to productivity levels on our job sites".*

Table 5.24 Frequency of mentions under internal business process perspective of Case B

	Mentioned by
Internal business process perspective (3)	
Measure	
Response time to business issues	RB2 RB3, RB4, RB5, RB6=5
Defect rate/level	RB2 RB3, RB4, RB5, RB6=5
Processing time	RB2 RB3, RB4, RB5, RB6=5
% of expenses to total sales (turnover) revenue	RB6=1
Successful tenders rate	RB1, RB2 RB3, RB4, RB5=5
Construction productivity rate (ratio of outputs to inputs)	RB2, RB6=2
Accident rate	RB4=1
Time loss to accidents	0
Safety & health audit	0
No. of risk management meetings	RB6=1
Risk management responses	RB2 RB3, RB4, RB5=4
Risk assessment review	0
Risk scores for core construction business activities	0
Level of safety/risk	RB2 RB3, RB4, RB5=4
Number of meetings	RB1, RB2 RB5, RB6=4
Availability of equipment	RB2 RB3, RB6=3

5.3.2.1.4 Learning and growth perspective

Table 5.25 illustrates the frequency of mentions of performance measures under the learning and growth perspective by the respondents. Employee skills/competency coverage ratio , training hours per employee per year , level of IT/ICT application in construction, and percentage of employees using computers in construction were the four most extensively used measures to assess the learning and growth performance of Case B.

One interviewed manager commented on the importance of competency coverage ratio to Case B by saying, *"We are consistently tracking our current employee skills against our needs….When we observe that there is gap, we will bring new skilled staff or provide training to existing workers"* (RB5). In a similar vein, RB2 stated, *"our company has relied heavily on the skills of its workers and technology for its success*". Another interviewed manager (RB3) further emphasized the need for construction workers of Case B to possess soft skills by stating, *"It seems that we are focusing on technical skills on the project site. I strongly believe that there is a need for workers to possess soft skills such as teamwork and interpersonal skills. These skills I think can improve communication and reduce conflicts on the sites".*

The interview findings indicated that Case B also focuses its attention on employee training. It appears that Case b is investing in training not only to provide employees' skills that are critical to the implementation of its work programme but also to keep abreast with developments in the industry. For instance, RB6 stated, *"Well, training is a necessity for us and we provide our staff training to mainly equip them with appropriate skills and knowledge to perform their duties and to meet the changing needs of our clients".* Moreover, RB1 commented, "*we have a small core of permanent staff that will be trained when the need arises, mainly through short term training programmes such as introduction to software, IT and new business models. Hence, we provide training just to keep them abreast with new development in the industry".* In recognizing the need to keep the cost of training to a reasonable level, RB1 further suggested, *"Apart from our core staff, we usually contract competent and trained staff to perform specific duties for the organization. There is no need for us to invest in a robust training programme within the company".*

The ICT applications in construction received much discussion in the case interviews. In that regard, RB6 stated:

> I can safely say that the application of IT technologies such as AutoCAD and the internet in the company is important to us. These applications reduce our processing time and improve performance of the firm. […] However, I think that the some employees pay little attention to improving their own productivity, and believing that the use of technologies will do every for them.

This above quote may suggest that employees of Case B are relying on the use of construction technology to 'just' perform their jobs but not to perform them efficiency and effectively.

Furthermore, the design manager (RB3) suggested that there is a lack of diffusion of construction ICT applications throughout the firm, and called for more construction technologies adoption and diffusion to all organizational levels of Case B. However, some interviewed managers agreed that financial constraints are probability posing a major restriction on the company's ICT investment decision.

Meanwhile, some case evidence showed that Case B was using measures for recognizing and rewarding employee for outstanding performance, investment in IT/ICT in construction, number of employee improvement suggestions, and employee productivity rate to assess its learning and growth performance.

Conversely, the case findings provided limited evidence that support investment in Knowledge management efforts, investment in leadership and management development, employee absenteeism rate, percentage of employee with degrees and employee satisfaction rating as important learning and growth measures of Case B. These results suggested that Case B perhaps is paying less attention to the development of its employees and managers because of the high turnover in the Saint Lucian construction industry. When discussing this viewpoint, RB6 commented:

> Well, investment in employees at all levels is very important for improving the performance of our company. However, I think our company as well some other companies in industry are not investing in the development of employees because of the high level of employees' turnover in the industry. This means employees must focus on their own self-development.

Consolidated case evidence derived from the interviews and document analysis found that Case B plans to introduce in the immediate future a staff appraisal system. The rationale for the introduction of appraisal system is to improve the evaluation of the performance of employees against targets as well as to facilitate staff recognition and rewards. The expected benefits that Case B could accrue from this system include increase the productivity and motivation of employees and its overall performance. Furthermore, the HRM department discussed the appraisal

system at all levels within Case B and there appears to be consensus of its acceptance. One of the interviewed manger commented, *"I think giving workers the opportunity to discuss performance issues though an appraisal system is a step in the right direction"* (RB4).

The appraisal system should have to be integrated with the PMM framework. This is expected to improve operational efficiency within Case B.

Table 5.25 Frequency of mentions of measures in the learning & growth perspective of Case B

Learning & growth perspective	**Mentioned by**
Measure	
Employee satisfaction rating	RB5, RB6=2
% of employee with degrees	0
Training hours per employee per year	RB1, RB2, RB3, RB4 , RB5, RB6=6
Employee productivity rate (Output per employee)	RB2, RB3, RB5=3
Employee absenteeism rate	0
Recognizing & rewarding employee for outstanding performance	RB4, RB5=2
Number of employee improvement suggestions	RB3, RB4, RB5=3
Competency coverage ratio - Level of employee skills/competences	RB1, RB2, RB3, RB4 , RB5, RB6=6
Investment in leadership development	0
Investment in Knowledge management efforts	0
Level of IT/ICT application in construction	RB1, RB2, RB3, RB4 , RB5, RB6=6
Investment in IT/ICT in construction	RB2, RB3 , RB5= 3
% of employees with computers	RB1, RB2, RB3, RB5, RB6=5

5.3.2.1.5 Supplier perspective

The case findings show that Case B was largely using four performance measures to evaluate its supplier performance. These measures include percentage of on-time supplier deliveries, supplier lead time, level of supplier's defect-free deliveries and the level of supplier relationship. It has been observed that most of these measures are time related. Moreover, the case findings further showed that these supplier performance measures were integral part of procurement planning, workflow management and decision-making. In addition, the case findings indicate that Case B uses business and relationship networks as important methods of building and maintaining strong buyer-supplier relationships.

When discussing aspects of supplier performance, one of the interviewed manager stated, *"I think our approach is to place orders within our suppliers' lead times. This will allow them to deliver materials to us consistently on time"* (RB5). Similarly, RB4 remarked, *"Knowing the lead time of our suppliers is an important aspect of our purchasing materials planning process".* Regarding on-time supplier delivery, one of the interviewed managers (RB2) explained, "*On time supplier delivery is a priority to us. We are working closely with our suppliers to get our orders delivered to us on time. Because when materials, components or parts are being delivered late, our work flows would be negatively affected"*. From the same viewpoint, RB3 suggested, *"Well, delivering inputs to us on time and in good condition is important for the smooth flow of our work".*

Interview findings indicated the need to regularly monitor the key suppliers' performance and capability to ensure that they deliver materials and components on time and with very few defects. Moreover, some interviewed managers added that where defective materials and late deliveries were regarded unacceptable, the suppliers were caution or replaced. The following quotation demonstrated this view:

> We have had situations where suppliers fail to deliver critical inputs for our projects on time. For instance, we ordered a large quantity of blocks from a local supplier, who failed to deliver by the due date. We realized that this would have a big impact on our project performance, so we had to switch to next local supplier (RB5).

RB5 further mentioned the importance of identifying and selecting reputable alternative suppliers to ensure timely delivery of the firm's critical inputs for its construction projects.

It is also observed that the Case B places high emphasis in assessing supplier relationships to increase efficiency in its operations and ultimately creating value. Moreover, there were much discussion on supplier relationships. For example, RB5 highlighted, *"We are closely evaluating and managing the relationship with our suppliers on regular basis. For example, we would let our suppliers know if we cannot make a particular payment by the due date. Similarly, if they cannot make a delivery on time, they will let us know".* RB2 also suggested, *"... maintaining a good relationship with suppliers can lead to timely deliveries of good quality materials and other products on our sites".* Another interviewed manager further noted, *"We communicate regularly with our suppliers to discuss key issues that might affect our relationship and obtain feedback for*

improvement. Also, we would attend supplier conferences especially when they are introducing new products or best practices in the market" (RB5).

According to the case evidence, level of contract compliance and fulfilment is another supplier performance measure that was used to some extent by Case A. Meanwhile, number of innovative suggestions from suppliers, suppliers' flexibility, and level of supplier satisfaction were the least used supplier performance measures.

Table 5.30 summarises the frequency of mentions of measures under the supplier perspective by respondents.

Table 5.26 Frequency of mentions of measures in the supplier perspective of Case B

Supplier perspective (5)	
Measure	**Mentioned**
Level of supplier's defect-free deliveries	RB1, RB2, RB4, RB5=4
Percentage of on-time supplier deliveries	RB1, RB2, RB3, RB4, RB5=5
Supplier lead time	RB1, RB2, RB3, RB4, RB5=5
Level of supplier satisfaction	RB5=1
Level of flexibility	RB5, RB6=2
Number of innovative suggestions from suppliers	RB3 =1
Level of supplier relationship	RB1, RB2, RB5, RB6=4
Level of contract compliance	RB2, RB3, RB4=3

5.3.2.1.6 Project perspective

For the interviews, Table 5.27 shows the frequency of mentions of performance measures under the project perspective by respondents of Case B. Strong evidence from the case study indicated that project performance measures are the most extensively used measure to evaluate the Case B's overall performance throughout its existence. RB1 highlighted the importance of the project performance measures to Case B by stating, "*Assessing the performance of our construction projects is of upmost importance to us as they drive the overall performance of the company".*

According to the case findings, the six most extensively used project performance measures within Case B include quality of workmanship and product, actual costs vs budgeted costs, project profit margin, level of project safety, time of delivery against agreed standards, and client satisfaction rating. Whilst discussing the aspects of project perspective in an interview, RB1 noted, *"Very*

importantly, we regularly monitor quality of work carried out on our project sites". Another interviewed manager stated, *"We devote considerable attention to the quality of workmanship on our projects. We do this by focusing on conforming to specifications and minimising defects and reworks"* (RB3). Furthermore, many interviewed managers were of the view that quality thinking and awareness among the workforce of Case B could contribute towards the maintenance of high quality of workmanship and final products.

Other significant comments made on the widely used project performance measures are as follows:

> When we prepare a tender for projects, our professionals such as the quantity surveyor will measure and qualify all the elements of a project for the tender. The tender takes into consideration the expected project profit margin. So, you will know from the outset the expected profit margin for each project (RB1).

> The level of safety on projects is an important measure in the organization. We have hired a health & safety officer who monitors and ensures that our employees and the company as whole comply with health & safety requirements, and records accident rate on projects. The officer is also responsibility for creating a general health and safety awareness among staff (RB1).

Productivity improvement has been recognized as a valuable means of reducing cost and time on construction projects and enhancing their overall performance. However, the case evidence showed that project productivity rate was the least used measure for project performance of Case B. This may imply that the Case B need to improve on its ability to measure productivity.

Furthermore, the interviewees highlighted some key factors affecting the productivity of the construction projects of Case B. They include complexity of the construction work, level of supervision, different management styles, confusion and disputes, employees' attitude towards work and late payment by major clients. For example, RB3 suggested:

> Well, we are always aiming to obtain high productivity on our job sites, but I think it is challenging in our organization to monitor productivity as well as to build a high productivity culture. This may be due to things like disputes and confusion on sites, the attitude of our construction workers and payment delays.

On the same viewpoint, RB5 pointed out:

> Well, you know, as you move from project to project your knowledge and productivity would most likely improve. But, over the years projects have become more complex, and the increased in their complexity would most likely reduce their

> productivity and overall performance. [….] I believe that in our organization proper documentation of lessons learned from our projects and sharing them among us can play a crucial role in dealing with project complexity and productivity.

This above quote may suggest that Case B needs to conduct post project reviews after the completion of the entire construction process of projects. These reviews would document the realisation (and non-realisation) of project objectives and lessons learned from completed projects. The results of the reviews would be fed into the strategic planning and project management processes in order to improve the performance of future construction projects.

Table 5.27 Frequency of mentions of measures within the project perspective of Case B

Project perspective	**Mentioned by**	**#**
Measure		
Time of delivery against agreed standards	RB1, RB2, RB3, RB4, RB5	5
Actual costs vs Budgeted costs	RB1,RB2, RB3, RB4, RB5, RB6	6
Quality of workmanship and product (e.g. level of defects or errors)	RB1,RB2, RB3, RB4, RB5, RB6	6
Project profit margin	RB1,RB2, RB3, RB4, RB5, RB6	6
Project productivity rate	RB3, RB4	2
Client satisfaction rating of project	RB2, RB3, RB4, RB5	4
Level of project safety	RB1,RB2, RB3, RB4, RB5, RB6	6

5.3.2.1.7 Environment and community perspective

The findings from the six semi-structured interviews (see table 3.28) and the document analysis provided evidence that support the level of environmental compliance as the most extensively used performance measure by Case B. In particular, the case evidence highlighted the importance of adopting appropriate environmentally sustainable practices to the business success of Case B. As noted by one of the interviewed managers (RB5), *"Recently the industry has experienced some serious accidents that have prompted regulators to be more vigilant and to increase occupational health and safety surveillance. So, monitoring environmental compliance robustly and adopting best practices are imperatives for us"* (RB5). This quote may suggest that there is currently increasing regulatory pressures from regulators of the Saint Lucian construction industry to increase the level of compliance with environmental standards and laws. This may has prompted Saint Lucian construction firms to increase the awareness and understanding of the importance of environmental compliance and issues amongst their staff. In the same vein, RB2 emphatically suggested:

> We are often involved in large infrastructure projects in this country. So, we pay close attention to environmental compliance with relevant laws and regulations. We try to ensure as much as possible that the noise, disturbances, waste and environmental pollutions from our projects do not have any serious negative impact on the neighbourhoods, in which they are being implemented.

Whilst discussing the environment and community perspective, most of the interviewees highlighted the consequences of not taking into consideration environmental issues seriously. Some of the key risks resulting from non-compliance with environmental laws and regulations identified in this case study include losses of working time from injuries and fatal accidents, bad publicity, reputational damage, imposition of fines and eventual closure of construction sites.

Energy consumption and waste level were also other extensively used environmental performance measures by Case B. Regarding energy consumption, RB4 remarked, *"For us, it is essential to monitor the level of energy consumption with a view to reduce it".* In the case study, construction waste was observed as a major cost in construction projects and accordingly should to be monitored constantly. As articulated by RB5, *"We do frequently keep track of waste levels. We would set level of wastage allowances for our construction projects and then compare the actual construction wastage against these allowances. As a result, necessary corrective actions would be taken".*

Interview evidence highlighted that good quality workmanship, proper design management, proper site supervision and a waste management plan as key factors necessary for managing waste on construction sites. As explained by RB1, *"As part of our waste management plan, we would make use of an offsite called a dummy site where we would temporarily store soils from excavation and other types of waste generated from our projects there. We would later decide which waste to reuse or disposal of".*

Moreover, the case findings provided some evidence to show that the number of jobs created and contribution to the local community were relevant performance measures used by Case B to evaluate its community performance. The following quotation demonstrated this view: *"We do employ some skilled persons in the communities where our projects are being implemented as well*

as making contributions to some community based organizations. That is something I know for sure" (RB6). In the same vein, RB1 emphasized:

> If we are implementing a project within a community, we try to employ some people with the necessary skills from this community. Other economic spin-offs to the community include assisting low-income residents in the community in making access to their homes a little more convenience, making donations and we assist the community in whatever ways we can. Also, those persons who are affected by our projects one way or other are being compensated for any consequential losses. For example, their properties are put back in their present conditions.

Case B places least priority on water consumption measure to assess its environmental performance. This result may imply that water consumption is not a cost significant component of Case B. RB2 suggested, "*I know the monthly consumption of water is received by our administration department, but I don't think water usage is regularly monitored to assess the patterns."* As the RB4 noted, *"Although we use a large amount of water for our projects, we would mainly monitor and rationalize the use of water when the water company has signalled a drought season or water shortages".*

Table 5.28 Frequency of mentions of measures within the Env. & community perspective of Case B

Environment & community perspective	**Mentioned by**
Measures	
Level of environmental compliance	RB1, RB2, RB3, RB4,RB5,RB6=6
Energy consumption	RB2, RB3,RB4, RB5=4
Water consumption	RB4=1
Wastage and scrap rate/level	RB1, RB3, RB4, RB5=4
Number of jobs created	RB1, RB5, RB6=3
Contribution to the local community	RB1, RB5, RB6=3

5.3.2.2 Objective 2: use of performance measures within Case B

The case findings showed that Case B has been using its performance measures for different purposes. The uses of performance measures are articulated under the following categories:

5.3.2.2.1 Measure performance use

In the context of the interview, Table 5.29 illustrates the frequency of mentions of measure performance use by respondents. Under the measure performance use category, the case findings indicated that Case B's performance measures were most extensively used for monitoring and

measuring progress, and evaluating performance. This implies the managers are constantly monitoring and evaluating performance against plan outcomes as a means of facilitating control of business activities. As the HR manager (RB6) emphasised in the interview, "*Firstly and very importantly we measure performance to know how well we are controlling activities, and then how well we are doing".* RB1 stated, "*Measuring and monitoring progress is an important practice in our organization, so that we can know whether or not our targets have been achieved as well as identify important areas that need improvements.*

Not surprisingly, Case B is using performance measures to some extent for learning existing work practices, as it may want to get better with its existing practices.

Table 5.29 Measure performance use of Case B

Measure performance	**Mentioned**
Monitoring progress towards achieving objectives	RB1, RB2, RB3, RB4,RB5,RB6=6
Evaluating performance	RB1, RB2, RB3, RB4,RB5, RB5 =6
Learning existing work practices	RB2, RB3,RB5=3

5.3.2.2.2 Strategy management use

Table 5.30 illustrates the frequency of mentions of strategy management use of performance measures by the respondents of Case B. The findings of the interviews and document analysis suggested that the strategy management use of performance measures is important to Case B. Performance measures of Case B were most extensively used for strategic planning, strategic decision-making, strategic implementation and problem solving. Some of the key responses from the interviewees include:

*"Well, project management is an important strategy of our company. So, we do undertake strategic planning for our projects. I can see that we are mainly engaged in quality and capacity planning and then constantly monitor progress against our plans and targets" (*RB5).

"Our performance measures are used to identify if there are any performance issues that need to be ironed out and resolved, and putting policies in place to manage and resolve those performance issues and problems" (RB6).

"The information we received from our performance evaluation system helps us with our decision making. But we still have issues with the speed at which we take decisions" (RB4).

> I believe we are using our performance evaluation system to manage problems on our sites such as disputes and rework. […] From my experience, I can see that if we were not managing disputes, unsafe practices and other problems on sites, I guess our projects would not fully realised their objectives (RB3).

Table 5.30 Frequency of mention of strategy management use of measures by Case B

Strategy management	**Mentioned by**
Strategic planning (formulation)	RB2, RB3, RB4, RB5, RB6=5
Strategy implementation/execution	RB2, RB3, RB4, RB6=4
Focusing attention on strategic aspects of business	RB6=1
strategic decision making	RB1, RB2, RB3, RB5, RB6=5
Strategic capabilities	0
Managing strategic change	RB1, RB6=2
Challenging strategic assumptions	0
Managing/solving problems	RB2, RB3, RB5, RB6=4

5.3.2.2.3 Communication use

Table 5.31 illustrates the frequency of mentions of communication use of performance measures by respondents of Case B. The case findings identified internal communication, external communication and communicating compliance with regulations as the key uses of performance measures of Case B under the communication use category. The communication use of performance measures is justified, as it is a vital aspect for achieving performance and accountability. RB5 commented, "*Well, our project managers and supervisors try their best to communicate relevant performance information, instructions and decisions to all our team members. They do so mainly through face to face meetings".* RB2 said during the interview, *"We would communicate the performance and progress of our projects to our clients, when necessary*".

Notwithstanding the importance of internal communication, the interview results have shown that poor internal communication within the Case B have resulted in poor information flows, lack of coordination between departments, duplication of efforts, project delays, reworks, and defects and errors. Furthermore, the interview findings have identified the need to use ICT to improve in

internal communications in order to achieve better performance for Case B. As noted by one of the interviewed manager:

> I know that we generate performance information that should be communicated to all managers of the organization, but it would be communicated to some managers. As you know, it is critically important for every manager to get the right information at the right time to perform his [or her] job effectively. This kind of approach would definitely adversely affect the coordination of our business activities. I believe that we can do much better to improve communication amongst us (RB5).

From this same point of view, another interviewed manager noted:

> If we all have to get a better understanding of our overall performance, I think we need to improve information flow between levels in organization such as between the Board of directors and management of the corporate office, and between management of the corporate office and workforce on the projects (RB2).

The case study findings showed limited usage of performance measures for communicating for benchmarking information. This may suggest that Case B is not focusing on basic aspects of benchmarking to create a sense of awareness among its staff.

It was not surprising to observe that Case B is not using its performance measures for communication between head office and divisions since it does not have divisions.

Table 5.31 Frequency of mentions of communication use of measures of Case B

Communication	Mentioned
Internal communication to management & employees at all levels	RB1, RB2, RB3, RB5, RB6=5
External communication to other stakeholders	RB2, RB3, RB5, RB6=4
Benchmarking (comparing) with other firms	RB
Compliance with regulations	RB2, RB3, RB4, RB5=4
Communication between head office and divisions	0

5.3.2.2.4 Influence behaviour use

Table 5.32 illustrates the frequency of mentions of influencing behaviour of performance measures by respondents of Case B. The consolidated evidence from both the interviews and document analysis indicated that Case B uses its performance measures to influence the behaviour of people. Under this category, cooperation and coordination, and managing relationships were the most important uses of the performance measures of Case B. Some of the significant comments made during the interviews include:

> Appropriate cooperation and coordination among all our workers is essential for us to improve performance, especially on our projects. We influence and interact with each other in one way or other at the workplace. I still think we can use incentives and intranet to improve the cooperation among our workers (RB3).

> Well, we deal with serval large construction projects that take some time to complete. […] The very nature of projects would result in issues like misunderstanding, disagreements, personal differences and conflicts among our employees and other stakeholders that could negatively affect project performance. Therefore, managing and maintaining good working relationships among our key stakeholders is a 'must' (RB5).

> We encourage on our construction sites a climate of openness and dialogue among the workers. This is important for discussing and solving project issues that may impact project success. Having said that, I believe we need to improve the relationship among staff in order to enhance project performance (RB2).

"We can't ignore relationships among our workers. Because ignoring it could affect our project objectives. Hence, we must continuously increase the awareness of the importance of relationship among the staff" (RB4).

The case findings provided some evidence that support the use of performance measures for role understanding and monitoring behaviour. Regarding role understanding, the HR manger pointed out:

> An analysis of our performance information shows that some of the staff did not fully understand their role within the organization. So, I, along with other managers, made a concerted effort to review and update job descriptions as well as to manage staff job expectations. This ensures that staff members have a clearer understanding of their roles. I also think this has reduced ambiguities in the roles among staff. […] In addition, managers are expected to provide staff with all the information needed to properly perform their jobs (RB6).

On the same viewpoint, (RB3) noted, *"Having a clear understanding of your job role in the organization is of particular importance as it would mainly direct our attention, time and effort toward accomplishing our defined role"*.

The case findings demonstrated that the current system of performance appraisal and management of Case B is unsatisfactory, and therefore it plans to introduce a new performance appraisal system.

More specifically, the HR manger also suggested that Case B plans in the immediate future to improve their performance appraisal system in order to monitor staff behaviour. In explaining the significance of using this new performance appraisal framework for monitoring staff behaviour, the HR manager (RB6) stated:

> I, with the support of other managers, have tried to make 'HRM policies' an important aspect of our performance management system and recently we have made a concerted effort to improve our HRM policies. In this regard, I can say we are moving away from ad hoc performance appraisal to a more formal performance appraisal system. This new appraisal system will allow us to effectively manage the behaviour and work results of our staff and ultimately improve their performance.

Furthermore, RB4 emphasized, *"I think it is a good initiative on the part of HR to consider a formal appraisal system to monitor staff behavior and their actual performance at work. This was discuss with staff. […] And we are looking forward to the implementation of this system".* Another respondent (RB3) commented, *"I believe that staff performance appraisal is a valuable exercise but it might be a challenge for us as we are just introducing it.*

The document analysis showed that the new performance appraisal system comprises rating scale from one to five for each established performance criterion for which employees would have to demonstrate their performance. The performance criteria include the quantity and quality of work performed, dependability, professional communication skills and attendance. Other potential performance criteria include attitude towards change and improvement, ability to work as a member of a team, complies with company policies and procedures among others.

The interview findings showed that the proposed staff performance appraisal system would be used in Case B for providing meaningful feedback on staff performance, specifying extrinsic rewards such as pay raise and identifying the need for training. One interviewed manager (RB2) went on to recommend the use of a 360-degree appraisal in Case B where co-workers and the direct supervisor will give feedback on the performance of an appraised employee as well as a self-assessment that will be completed by the appraised employee.

The case findings showed limited used of the firm's performance measures by managers for motivating staff and compensating behaviour. Some of interviewed managers suggested that

compensation of staff for performance has been ignored in the Case B. On the contrary, the HR manager (RB6) suggested that Case B at the last year-end provided compensation and incentives to staff order to motivate them. This suggests that the Case B may have given a one-off incentive to staff. Some interview evidence considered that effective linkage of rewards and incentives to individual and/or organizational performance, which is integral for motivating staff. This viewpoint was echoed by RB4, *"I strongly believe that if we adequately compensate our staff, they motivation and performance will increase as well as the organization's performance".*

Table 5.32 Frequency of mentions of influencing behavior use of measures of Case B

Influence behaviour	**Mentioned**
Monitoring behaviour via performance appraisal	RB3, RRB5, RB6=3
Motivation of organizational members	RB6=1
Role understanding	RB2, RB5, RB6=3
Cooperation and coordination	RB2, RB3, RB4, RB5, RB6=5
Rewarding or compensating behaviour	RB6=1
Managing relationships	RB2, RB3, RB5, RB6=4

5.3.2.2.5 Improvement and learning use

Table 5.33 illustrates the frequency of mentions of improvement and learning use of performance measures by respondents of Case B. Strong evidence emerged from the case study to show that a relevant use of performance measures in Case B is for performance improvement and learning. In this category, performance improvement and performance feedback information were the most significant uses of performance measures of Case B. Regarding the importance of performance improvement to the Case B, RB5 remarked:

> Well, we try to capture performance information to support performance improvement in the key aspects of our organization, especially our projects. I can see that we are making some strides to seek better and new ways of doing things in the organization so that we can deliver high quality products and meet our clients' expectations.

According to RB2, "*We would identify and prioritize problem areas needing improvements and then we would take appropriate decisions to bring about improvements in these areas".* The findings of the interviews revealed that Case B needs improvements in areas of materials management, financial management and communication. In addition, some key drivers for performance improvement in Case B such as construction technology and competent staff were

identified. RB5 stated, *"Our team here is fully committed to performance improvement. And so we try to achieve improvement through the use of modern equipment and technology, our competent staff and resolving problems as soon as possible".*

RB6 highlighted the importance of performance feedback in the following comments:

> Well we try to capture feedback information on our organization's general performance as well as our project performance. The feedback information from our key staff is used to take timely actions and improve performance in the organization. Although I think, we should encourage supervisors to make more use of formal reports when providing feedback information to us, which should be timely as well.

On the same viewpoint, RB4 added, "*Well, we are using our performance evaluation system to obtain feedback to monitor the performance of our projects and I think to some extent to improve our construction practices. […] I think more specifically it is used to avoid rework and unsafety practices on site".*

The case findings suggest that Case B uses performance measures to some extent for enhancing accountability. In support of this viewpoint RB5 suggested, *"Basically, our performance information helps us to focus on accountability for performance. We try to ensure that the obligations of our staff and sub-contractors are most time met and our projects are run smoothly".*

Conversely, the case findings suggested that there is need for Case B to focus on improving its accountability. In this regard, RB3 stated:

> As you know, accountability is important for the success of any firm. But how can accountability be improved in this organization when I can see that nonperformers are escaping from accountability because some people [supervisors] are casting a blind eye on them. This means that not everyone in this organization would be held accountable for his or her actions. […] I strongly feel that we should hold everyone responsible for the achievement of results in this organization.

Evidence from the case study highlighted some mechanisms to improve the accountability within Case B. They are as follows: linking operational plans to a strategic plan, setting performance targets and standards, incentives for outstanding performance, sanctions for non-compliance or

poor performance, promoting appropriate behaviours and appropriate monitoring and reporting mechanisms. For example, RB2 stated:

> Well, as a whole our company is held accountable to the clients for the final project outputs. But I still feel that there is need for greater accountability at all levels in the company. It is very important for us to frequently set performance targets for all our staff and then monitor their actions and performance against these targets.

RB3 commented, "*I think we need to link our operational plans with a strategic plan, which I am not sure we have. […] I believe this will allow the staff to see their work relative to the bigger picture and hereby strengthen accountability in our organization".*

This quote may suggest that the Case B has not fully internalized and cascaded its strategic plan or plan business to all hierarchical levels. Furthermore, RB4 commented:

> There are no major incentive to improve performance and accountability in this organization. As we all know an employees will feel good when they are given an incentive for achieving attainable or higher attainable targets. […] Recently, it appears that these staff issues have reached the ears of the admin. [Administration department].

The above quote implies that Case B should promote self-accountability of employees through the provision of rewards and incentives.

The case study provided some evidence on the use of performance measures by Case B for high-level learning. The project-engineering manager (RB5) attempted to explain the significance attached to higher level learning within Case B:

> Well, we would obtain information on the progress of our projects and asked ourselves ''are we on the right track"? Additionally, we would identify the serious problems on site especially challenging and highly complex ones through dialogue, thinking of innovative ways of resolving them and implement the recommended actions. I believe this kind of approach creates a sense of consciousness and learning on the site.

RB6 noted, "*Well we deploy our performance information to try to do things differently and more effectively in our organization. I think we are gradually getting there.* Moreover, the case study has demonstrated that there is scarce evidence on the use of performance measures for benchmarking practices and improving reputation of Case B. This may suggest that managers in

the Case B have not seen benchmarking as an important practice to support the improvement of its operations and overall performance, as suggested by the literature. A few interviewees suggested that Case B does not practice formal benchmarking mainly because of a lack of a set of performance measures for benchmarking well as a lack of investment in benchmarking. Some significant comments made regarding benchmarking practices are as follows:

"I don't think we are really comparing the performance of our firm with that of others in the industry" (RB4).

"I don't think we are using our information to formally compare the company with other firms in the industry. But I know we are regularly searching for industry best practices in order to improve our performance" (RB3).

The quote from BR3 may imply that managers in the Case B may not be using an informal benchmarking exercise.

Table 5.33 Frequency of mentions of improvement and learning use of measures of Case B

Improvement and learning	Mentioned by
Performance feedback information	RB2, RB3, RB5, RB6=4
Double-loop (high level)learning	RB3, RB5, RB6=3
Performance improvement	RB2, RB3, RB4, RB5, RB6=5
Improving firm's reputation	0
Enhancing accountability	RB3, RB4=2
Benchmarking practices	0

5.3.2.2.6 Managing risk use

Table 5.34 illustrates the frequency of mentions of managing risk use of performance measures by respondents of Case B. According to the case evidence, Case B made extensive use of performance measures for project risk and operational risk under the 'managing risk use' category. Regarding project risk, RB3 suggested:

> The types of construction projects such bridges we undertake are very risky, and therefore it is vital for us to manage the risks of our projects diligently. Largely, we identify and understand the various risks of our projects and their impact on project objectives. But I feel that project risks are not properly allocated to the responsible workers or parties.

RB5 argued that:

> We are greatly concerned about managing and minimizing project risks because our major of projects are complex. I think we are trying our best to identify and prioritize any potential risks that may affect our projects as well as the best possible solutions to minimize the identified risks. However, I firmly believe that there is need for greater focus on managing project risks at our corporate level.

The comment form RB5 may illustrate that Case B is managing its risks in a fragmented way rather than in a holistic manner. Similarly, RB6 indicated that Case B has not embraced enterprise risk management in managing its risks.

Some evidence from the case study suggested that Case B has been using performance measures for managing financial risk. In explaining the importance of financial risk to Case B, RB6 stated:

> Whilst I am not certain that our performance management system has been used for assessing the overall enterprise risk management, but I believe it is mainly used to monitor and manage financial risks using the cash flow, debt analyses and other key financial ratio. This I think will ensure that the company's survival in the future.

Meanwhile, Case B's performance measures were least used for managing strategic risk. This may suggest that case B's strategic plan may not be fully developed. Further, Case B may not be monitoring the factors that would directly affect its strategic objectives.

Table 5.34 Frequency of mentions managing risk use of measures of Case B

Manage risks	**Mentioned by**
Strategic risk	0
Operational risk	RB2, RB3, RB4, RB5=4
Financial risk	RB5, RB6=2
Project risk	RB2, RB3, RB4, RB5, RB6=5

5.3.2.3 Objective 2: CSFs of Case B

Table 5.38 illustrates the frequency of mentions of CSFs by respondents. The case results identified 10 important CSFs for Case B. The CSFs of case B include profitability, project management, liquidity, client or customer satisfaction, quality of service/product, contract/procurement management, risk management, information & equipment technology utilisation, organizational competency and leadership. Examples of some relevant comments made by the interviewed managers include:

> Well profitability is very critical to us for ensuring the survival and success of the company in this competitive market. […] Without achieving an appropriate level of profitability, I think our company will go under. So we must make every effort, be it in our work or seeking for business opportunities, to the improve profitability in this company (RB3).

The core business activity of our company is coming from construction projects. Therefore, effective project management is crucial to the success of our organization (RB2).

The use of construction equipment technologies such as modern concrete mixing and pouring equipment, modern excavators as well as other modern road construction equipment is very important at various stages of our projects, especially the implementation stage (RB5).

> The company has grown over time in terms of its human and physical resources under the direction and leadership of the managing director. I believe the managing director developed a personal vision of making the company become a leading engineering and construction firm in Saint Lucia. Consequently, his committed leadership has turned this vision into actions and reality (RB6.)

Meanwhile, the HR manager (RB6) described the leadership style of Case B as individualised or individual oriented style and stated, "*given that collaboration is important in the industry, the company now needs to move beyond the individualized leadership style to a more consultative and participative leadership style".* In a similar vein, some interview evidence showed that Case B should fully adopt team leadership style since it is a project-based organization. This viewpoint implies that whilst leadership is a critical factor to the success of Case B, managers should take a keen interest in the leadership style (a sub-theme) adopted to meeting the needs of the company.

The case study provided some evidence to illustrate that client relationships, process management and supplier management were important CSFs of Case B. Furthermore, one of the interviewees emphasised that communication is an important CSF of Firm B and said:

> I believe that communication plays a critical role in the organization. In fact, the dissemination of information on various components and stages of our projects to our implementation agencies and other relevant stakeholders is critical for the success of our projects and the company as whole. Furthermore, effective two-way communication is necessary to establish a common understanding on key issues between our stakeholders and us (RB1).

The case evidence demonstrated low importance to employee learning and development, growth and financial stability and IT competency as CSFs. Meanwhile, the majority of the interviewees felt that learning and development is not currently principal CSF, but is becoming an important CSF in the future in order to improve its performance. In addition, motivation and satisfaction of employees were the focal points of the discussion under employee learning and development. They suggested some strategies that Case B can use to increase its employees' motivation and satisfaction, which include inter alia rewards to employees or teams for contributing significantly to the firm's improvements and for outstanding employees' performance, providing more general and specific training and other learning incentives.

Table 5.35 Frequency of mentions of CSFs by respondents of Case B

#	Perspective	Critical success factors	Mentioned
1	Financial	Profitability	RB1, RB2, RB3, RB4, RB5, RB6=6
		Liquidity	RB2, RB3, RB4, RB5, RB6=5
		Growth	RB5, RB6=2
		Stability	0
2	Customer	Client or customer satisfaction	RB2, RB3, RB4, RB5, RB6=5
		Client relationships	RB2, RB3, RB4=3
		Client acquisition/retention	0
3	Internal business processes	Quality of service/product	RB2, RB3, RB4, RB5, RB6=5
		Contract/procurement management	RB2, RB3, RB4, RB5=4
		Process management	RB2, RB3, RB4=3
		Risk management	RB2, RB3, RB4, RB5=4
		Information & equipment technology utilisation	RB2, RB3, RB4, RB5=4
		Communication	RB1=1
4	Learning and growth	Employee learning & development	RB2, RB3=2
		Organizational competency:- Employee competencies and skills; Top management competencies; & Other work related competencies	RB2, RB3, RB4, RB5, RB6=5
		IT Technology competency	0
		Leadership	RB1, RB2,RB4, RB6= 4
5	Supplier	Supplier management	RB3, RB5, RB6=3
6	Project	Project management:- Quality management; Conflict management; Project risk management & leadership	RB1, RB2, RB3, RB4, RB5, RB6=6
7	Environment & community	Sustainability	RB2, RB3, RB5, RB6=5

5.3.2.4 Objective 2: Setting targets for performance measures of Case B

The case findings provided strong evidence to suggest that Case B sets targets for its key performance measures. More specifically, all six interviewees suggested that they set performance

targets at organizational and staff levels. This means that managers of Case B would monitor and report its performance against the established priority targets. Whilst discussing the setting of performance targets for performance measures, an interviewed manager noted:

> We do set targets for some of our key performance measures to know our achievements at a particular point in time. I think is it also important to set performance targets that are seem to be achievable by both the manager and employee as well as providing related incentives so that the employee would be more committed and motivated towards meeting set targets (RB6).

According the case findings, percentage of gross profit on all contracts, percentage of tenders won, numbers of day lost to absenteeism were some examples of the performance targets set by Case B. In the same vein, some evidence showed that communication of the values of key targets to the right people seem to be a problem in Case B. As noted by RB6, *"I have noticed that the values of some targets are not commutated to managers who need to know them".* This implies that managers could not know with certainty whether they are working towards improvement and the effectiveness of Case B.

In setting targets, managers and employees are expected be more accountable for the achievement of the set performance targets. However, case evidence showed that some managers are not taking full ownership of performance measures and targets, which could negatively affect accountability.

Some interviewed managers commented that more realistic performance targets would be set for employees upon the rolling out of the new performance appraisal system. This could allow managers of Case B to better evaluate the achievement of employees' performance.

5.3.2.5 Objective 3: Development of performance measures being used by Case B

The case findings presented evidence to suggest that performance measures of Case B have been largely derived from its strategy development process such as its mission and strategies. In contrast, one interviewed manager (RB4) did not agree that performance measures of Case B were directly developed from the strategy process, because of a perceived lack of dialogue with members on strategic issues.

The case findings showed that Case B develops performance measure from its important CSFs and existing PMM frameworks. Furthermore, some evidence from the case indicates that the performance measures of Case B were derived from industry standards.

Table 5.36 Sources used to develop performance measures of Case B

Source	Mentioned by
Strategy development process	RB2, RB3, RB4, RB5, RB6=5
Existing PMM frameworks	RB2, RB3, RB4, RB5,RB6=4
CSFs	RB2, RB3, RB5, RB6=4
Industry standards	RB2, RB3, RB5 =3

5.3.2.6 Objective 4: PMM frameworks used by Case B

Table 5.37 shows the frequency of mentions of the PMM frameworks used by Case B to evaluate its performance. The findings emanating from the case study revealed that Case B has an internally developed PMM framework in place, which is not fully structured and integrated. This implies that Case B does not fully use any well-recognized CPMM framework such BSC or EFQM identified in the literature. However, Case B has utilized some aspects from them to develop its internal PMM framework. The interviewees suggested that the internally developed framework of the Case B is used to evaluate organizational performance and project performance. The following are important comments made by some respondents during the interviews:

> We have developed an internal framework, called performance monitoring and evaluation system to provide information on our performance. It is not a well-structured framework, but it is a workable and flexible framework to allow us meet the objectives of our projects and the company (RB1).

"*We are using our own internally developed performance management framework to assess our performance. I believe it is based on providing project, contract and financial information. Also, we have had some discussions on how to improve on it such as linking it to HRM"* (RB6).

The comments made by RB6 may suggest that the PMM framework of Case B is more oriented towards evaluating project and financial performance. Two other interviewed managers echoed similar view.

Case findings identified some components and tools of the performance evaluation framework of Case B to assess its performance. Some of the key components and tools identified include project control tables, project activity or work plans, industry KPIs, data collection forms, progress reports, project management office, an accounting system, among others. For example, RB3 specified, "*currently, we are mainly using project control tables, activity work plans, and progress reports as part of our performance evaluation system. This system gives us the necessary data and information to monitor and control our projects".*

The interview findings highlighted two key limitations of PMM framework of case B: (1) the sub-systems of PMM of its disparate departments are not strongly integration to form a unified PMM framework, and (2) slow or poor performance communication throughout the organization. The project engineer manager (RB5) explained the shortcomings of the Case B:

> The performance evaluation (PE) system we are using on our project site is independent of the PE systems that are operating at head office. So, there is need to integrate our systems with other PE systems at head office so that all managers can know all the main aspects of performance in the company. This I think will allow improve performance communication among us.

This comment from RB5 suggested that intra-firm performance of Case B is being measured and evaluated from an independent department perspective rather than an integrated perspective.

Table 5.37 Frequency of mentions of PMM frameworks used by Case B to evaluate performance

PMM framework used	Mentioned by
Internally developed performance management framework	RB1, RB2, RB3, RB5, RB6=5
Project based measurement framework	RB3, RB4=2
Construction industry KPI framework	RB2, RB3, RB4, RB6=4
Balanced Scorecard	0
EFQM Excellence Model	0

5.3.2.7 Objective 5: Barriers to and strategies for CPMM framework implementation

Table 5.38 shows the frequency of mentions of barriers to the successful implementation of a CPMM framework in Saint Lucian construction firms. The findings of the interviews and document analysis identified more important internal barriers compared to external barriers for

CPMM implementation. This implies that managers should focus more on the internal barriers for the successful implementation a CPMM framework in Case B.

5.3.2.7.1 Internal barriers to CPMM framework implementation

The case study provided substantial evidence to show that lack of knowledge and understanding of the concept of PMM, lack of understanding of the expected benefits from CPMM framework, inappropriate organizational culture, poor communication practices and lack of coordination between departments were the five significant internal barriers to CPMM framework implementation. For example, RB5 stated, "*The lack of knowledge about performance management process will definitely be a key barrier. I don't believe we are quiet verse in all aspects of performance management that would be required to implement a new system of performance evaluation".* As emphasized by RB3, "*Frankly speaking, I think there is a general lack of understanding of the potential benefits of using a new and modern performance evaluation system in the industry, especially at project and operational levels".*

Meanwhile, RB6 attempted to summarise the underlying culture of the Case B:

> The key persons in the company are stuck in their own ways, they are accustomed of doing things in a particular way, and do not want to change to new ways of doing things. Therefore, I believe this would be a main barrier to the implementation of new management practices or initiatives in our company.

The comment by RB6 illustrates a non-adaptive organizational culture within Case B where status quo and silo mentality exist. Meanwhile, RB5 went on to suggest that a performance improvement culture is lacking within Case B. Furthermore, many of the interviewed managers considered Case B's culture as a fragmented culture, while a few saw it as a paternalistic culture.

As perceived by interviewed managers, Case B would need a new performance culture for the implementation of a CPMM framework. They further identified such culture as one that should:

- Encourage greater accountability throughout the firm;
- Promote performance improvement and excellent throughout the firm;
- Promote employee motivation, satisfaction and excellent;
- Stimulate commitment to change at all levels of the firm;

- Encourage open communication and collaboration in the firm; and
- Establish an integrated practice between departments and teams.

Some evidence from the case supported that the lack of leadership and top management support, inadequacy of appropriate IT infrastructure support and resistance to change as barriers to the successful implementation of CPMM framework. The moderate evidence emerging from the case findings for lack of leadership and top management support was surprising as non-commitment from management could usually lead to an unsuccessful implementation of a CPMM framework in a firm.

According to the Case findings, the least significant barriers to the successful implementation of CPMM framework in Case B include inappropriate organizational structure, lack of clear strategies, inappropriate organizational structure, higher implementation costs and firm size.

5.3.2.7.2 External barriers to CPMM framework implementation

The findings of this case have revealed that political uncertainty was the only significant external barrier to the successful implementation of a CPMM framework. For example, RB2 commented:

> As you aware, there was a recent change in the government in Saint Lucia. Furthermore, a large portion of our construction work comes from the government. Consequently, I can definitely see that the development and uncertainty in the political arena could hinder us from implementing any new performance evaluation system in the immediate future. […] I believe maintaining a collaborative relationship with the key government officials would be an important way of managing this barrier. Well, we will see how it does.

Meanwhile, there was little evidence to show that level of competition, legislation and regulation in the industry and economic downturn and uncertainty were important barriers to the successful implementation of CPMM framework in Case B.

Table 5.38 Frequency of mentions of CPMM framework barriers for Case B

Barriers to the implementation of a CPMM Framework	Mentioned
Internal factors	
Lack of top management support	RB2, RB3,RB4=3
Lack of employees' involvement & participation	0
Lack of knowledge & understanding of the concept of PMM	RB2, RB3, RB4, RB5, RB6=5
Ambiguity or lack of understanding of the expected benefits from CPMMF	RB2, RB3, RB4, RB5, RB6=5
Higher implementation costs	RB4=1
Inadequate resources for CPMMF implementation	0
Inadequacy of appropriate IT infrastructure support	RB2, RB3, RB5=3
Lack of clear strategies &/or strategic alignment	RB2, RB5=2
Business/firm size	RB5=1
Inappropriate organizational culture	RB2, RB3, RB5, RB6=4
Poor communication practices	RB2, RB3, RB4, RB6=4
lack of coordination between departments	RB2, RB3, RB4, RB5=4
Resistance to change	RB1, RB2, RB6=3
Leadership/management styles	RB5, RB6=2
Inappropriate organizational structure	RB5=1
External factors	
Level of competition	RB1, RB4=2
Legislation & regulation in the industry	RB1=1
Reluctance to adopting new technologies	0
Economic downturn/uncertainty	RB5
Political uncertainty	RB1, RB3, RB4, RB5=4
Social & ecological uncertainties	0

5.3.2.7.3 Strategies to overcome barriers to CPMM framework implementation

Table 5.39 depicted the frequency of mentions of strategies to overcome the barriers to the implementation of a CPMM framework by Case B. Findings emanating from this case study revealed four prominent strategies that Case B can deploy to overcome the barriers to the implementation of a CPMM framework. The prominent strategies include leadership and top management commitment, education and training, supportive culture of PMM within the organization and buy-in and involvement of organizational members in the implementation process of a CPMM framework. Interviewed managers made the following comments on the importance of implementation strategies during interviews:

"Leadership and management commitment is one of the most important strategy for the successful implementation of any new system because they must direct and manage the resources of a firm" (RB2).

> In addition to management support, I believe a supportive organizational culture and structure would definitely facilitate the implementation of a new performance

> evaluation system. Generally, I think these organizational factors do not receive the attention they deserve in the organization (RB5).
>
> I think it is critical that all the users of the new performance evaluation system know how to operate it and therefore the company would have to provide adequate training for both staff and managers that would be involved its implementation and use. The training, I believe, can be in performance management, IT, leadership, team building, etc. (RB6).
>
> For the implementation of a new performance management system, I believe it would be compulsory that managers and other relevant staff are educated and trained in performance management. The education and training in performance management would allow them to implement and use the new performance management system (RB3).

The case finding that leadership and management support is the most prominent strategy is justifiable as it is a prerequisite to accommodate effective change for the successful implementation of a CPMM framework in the Case B. Furthermore, leadership and management will also lend support to other strategies such as education and training and strategic planning.

The above quote from RB3 suggested that the education and training of relevant members of Case B would enable them to understand the key concepts of PMM as well as to operationalize the CPMM framework. Moreover, the education and training will not only secure their commitment to the system implementation and use, but would bring positive behavioural changes towards the successful implementation of a CPMM framework in Case B.

The case study provided evidence that supports increase accountability throughout the organization, aligning rewards to performance measures and appropriate ICT as important strategies to overcome the barriers to successful implementation of a CPMM framework. Meanwhile, the case offers limited evidence to support making PMM an integral part of Firm's strategic planning, clear organizational strategy and goals, effective communication, appropriate organizational structure, an established dedicated PMM team and allocated resources, and appropriate implementation plan as important strategies to overcome the barriers to successful implementation of a CPMM framework.

Notably, RB1 commented on the importance of making PMM an integral part of strategic planning:

> Firstly, we need review our strategic plan. In it [the revised strategic plan], we should have a mission statement that is clear link with strategies, specific goals and objectives. Then very importantly, we need to make performance management an integral part of the strategic planning process and make everyone that would be involved in the implementation process 'buy' into the company's vision and mission as well as the new performance evaluation system.

This quote illustrates that the RB1 has attempted to explain an implementation plan for a new PMM framework. In a similar vein, RB 3 stated, *"well, a proper implementation plan is a critical strategy to overcome the barriers to performance evaluation system implementation".*

Table 5.39 Frequency of mentions of strategies for CPMM framework by Case B

Strategies to overcome barriers to the implementation of a CPMM Framework	**Mentioned by**
Leadership and top management support/commitment	RB1, RB2, RB3,RB4, RB5, RB6=6
Gaining people's buy-in and involvement in a CPMM framework process	RB1, RB2, RB3, RB5, RB6=5
Education and training	RB1, RB2, RB3,RB4, RB5, RB5=6
A supportive culture of PMM within the organization	RB2, RB3,RB4, RB5, RB6=4
Increase accountability throughout the organization	RB2, RB3, RB4=3
Aligning rewards to performance measures	RB2, RB3, RB4=3
Establish dedicated PMM team and allocated resources	RB2, RB3=2
Appropriate ICT and communication	RB5,RB6=2
Make PMM an integral part of Firm's strategic planning	RB1=1
Appropriate organizational structure	RB3,RB5=2
clear organizational strategy and goals	RB1=1
Appropriate implementation plan	RB3, RB5=2
Effective communication	RB3, RB6=2

5.3.2.8 The need for PMM framework in the Saint Lucian construction industry

The case findings suggest that there a need for applying a CPMM framework in the Saint Lucian construction industry for performance evaluation and benchmarking. Generally, the interviewees of Case B felt that a CPMM framework is applicable to the Saint Lucian construction industry. However, it should be simple to manage and understand by users in the industry.

5.3.2.9 Recommendations for improvement in PMM practices

The case findings provided some ways of improving the existing PMM framework of the Case B, which include:

- Increase knowledge and understanding about PMM in construction.
- Integrate the various sub-systems to form a unified PMM framework through the use of appropriate ICT technologies;
- The use of a reliable centralized database information management system;
- Introduce a new (or modify existing) PMM framework or modified which should include some new performance measures, be link to HRM model;
- Improving the communication and information sharing within the organization;
- Promoting a performance management culture; and
- Utilize visual aids for a proposed PMM framework or on its components.

Furthermore, some of interviewees indicated that the concepts of PMM should be incorporated in the curricula of construction related programme offered at higher educational institutions (HEIs) in Saint Lucia. It should be noted that most of interviewees suggested that continuous training and education in PMM in necessary to build a performance management culture throughout the industry. Some interviewees argued that the application of a CPMM framework could bring about change in the culture of Case B. For example, RB6 suggested:

> Well, I would like to see the introduction of a new system that would assess the entire company's performance. This system should allow us to predict and monitor both financial and non-financial aspects of the company in line with prevailing market conditions. Also, a formal staff performance appraisal should be an integral part of this new system, which could bring about change in staff behaviours and actions towards improving both individual and organizational performance.

5.4 Chapter summary

This Chapter has analysed and synthesised the findings of the individual cases studies conducted in Saint Lucia on PMM. The findings from the two case studies provide an understanding of their context that influence the adoption PMM as well as PMM practice within then. The next chapter presents the findings across the two case studies.

Chapter 6 Case Studies: cross case analysis

6.1 Introduction

Findings from the analyses across the two case studies are presented in this chapter. The results of the case studies generated from the contextual background information and the related research questions are compared and contrasted using a replication logic and pattern matching. Moreover, this chapter provides the extent to which the findings are replicated across the case studies. Furthermore, it discusses the similar results (literal replication) as well as contrary results but for anticipated reasons (theoretical replication) of the two case studies as suggested by Yin (2018).

The cross-case findings from these case studies were gathered from the semi-structured interviews and the analysis of relevant documents from the two case studies. As mentioned earlier, seven semi-structured interviews were conducted with managers of Case A, whilst six semi-structured interviews were conducted with managers of Case B. The main findings of the individual case studies and the consolidated findings are presented under the relevant research objectives. Furthermore, this chapter presents the main themes and categories that emerged from the analyses of, the key patterns and their relationships among the case studies.

6.2 Background

Table 6.1 presents a summary of the contextual background of each case study firm. Case A and Case B are both locally owned construction firms in Saint Lucia facing similar political, economic and competitive pressures from the business environment. Case A is considered as a large-sized firm, while Case B is considered as a medium-size firm. Both case study firms have been in existence in Saint Lucia for over ten years. They have been operating mainly in the local market and to a limited extent in the Eastern Caribbean construction markets serving both public and private clients. The construction markets that they served are competitive and therefore they must apply appropriate competitive strategies to ensure their survival and growth. In this regard, Case A primarily pursues cost leadership, diversification and growth competitive strategies, while Case B mainly pursues a cost leadership competitive strategy.

Like other business organizations, organizational culture influence the strategy and performance of both case studies. The culture of Case A typifies a middle ground between adaptive corporate and non-adaptive corporate cultures. To characterize its culture, Case A has been changing its strategies but not very quickly to respond to or capitalize on business opportunities of the changes in the business environment. Accordingly, Case A supports, to some extent, organizational change, innovation, collaboration and giving managers more autonomy. Case A plans in in future to move to towards a more adaptive corporate culture. In contrast, Case B do not change its strategies quickly to respond to changes in the business environment, and therefore, is less innovative and provides less support for change and management autonomy.

Both case study firms have relied on internal development and growth (organic growth) as their method of development and growth in the market. This implies that they place emphasis on building and developing their competencies and resources. Moreover, the corporate orientation of both case study firms is hinged on the founders' philosophy, entrepreneurial experience, delivering value to clients and customers, and responding to business opportunities and threats in their markets. Case A organizational design has evolved from a functional structure to a divisional structure in order to support its business activities, strategies and objectives, while Case B adopts a functional structure. For future development and growth, Case A endeavours to rely on related business diversification, business development, and obtaining improvement in business processes and systems to support or improve its position in the market. At the other end of the spectrum, Case B plans to mainly explore improvement in its business processes, systems and market development by offering its existing products and services to new markets in order to support or improve its position in the market.

Furthermore, both case study firms have internal connection to their staff and external connections with business partners through networks. However, Case A is a more market-oriented organization that adopts a formal approach to strategic marketing to remain connected to customers and the society as whole. Case A strongly beliefs that marketing and branding are two key elements in its success. Moreover, Case A has marketing expertise, plans and budgets to support its marketing strategy and uses several modes of communication to dialogue and build relationships with

customers and clients including advertising, sales promotion, public relations, direct marketing among others.

Table 6.1 Comparison of contextual background of Cases, A and B

Firm Characteristics		**Case A**	**Case B**
Size		Large	Medium
Ownership		Local	Local
Existence		22 years	15 years
Market		Domestic and regional	Domestic and regional
Market segments		Focusing on several key market segments	Focusing on a few key segments (e.g. infrastructure).
Client		Private and public clients	Private and public clients
Organizational structure		Divisional of business units and decentralized.	Functional structure and centralized
Strategy		Cost leadership and Differentiation (focus) Market penetration and growth, and related diversification Repeat and diversified business	Focus cost leadership Growth, related diversification Repeat business
Corporate culture		Lies between adaptive and non-adaptive cultures	Non-adaptive culture
Method of development		Internal development/growth	Internal development/growth
Key aspects of business model		Balanced portfolio; Strong strategic capabilities; Construction project management; Stronger businesses, strong relationships	Construction project management; Strong relationships
Connections	Internal	Staff	Staff
	External	Networking and marketing	Networking
Corporate orientation		Corporate culture, history Founder's philosophy, entrepreneurial experience Client service	Corporate culture, history Founder's philosophy, entrepreneurial experience Client service
Business environment		Competitive and highly uncertain	Competitive and highly uncertain
Future development		Related diversification, business development, improvement in business processes, systems	Improvement in business processes, systems

6.3 Key findings across the two Cases

In order to facilitate analysis and its interpretation of themes, the following importance weights were assigned to the variables or themes emanated from the two case studies, namely extensively used, moderately used and least (limitedly) used or most (highly) important, moderately (somewhat) important and least important, where appropriate. Equal priority was given to both quantitative and the qualitative outcome of the study. This is because the qualitative stage of the

study comprises two case studies, in which semi-structured interviews and analysis of documents were documented. It is worthy to note that documentary evidence is more reliable than oral evidence.

6.3.1 Objective 2 Assessing performance of the Cases and the uses of measures

This objective focuses on assessing the extent to which the two cases used performance measures, CSFs and performance targets to measure and manage their performance. In addition, this objective concentrates on identifying the uses of the performance measures of the two cases.

6.3.1.1 Objective 2: Performance used by the two cases

There is a preponderance of evidence to suggest that the two case study firms, A and B have relied on both financial and non-financial performance measures across the seven perspectives to monitor and evaluate their business and projects performance. These performance measures are necessary to meet the interest of their key stakeholders such as shareholders, investors, customers, employees and society as well as supporting their strategies.

According to the cross-case findings from the two case studies, project perspective was the most important performance perspective utilized by these firms. The internal business process perspective followed this perspective. This may imply the two case study firms are giving more priority to non-financial performance measures than financial performance measures.

6.3.1.1.1 Financial perspective

Table 6.2 shows the results of the two cases relating to the financial perspective. The consolidated findings illustrated that the two case studies are most extensively using four measures to evaluate their financial performance. They include profit margin, return on investment, cash flow level and receivables level. These financial measures cover the profitability, short-term solvency and liquidity as well as providing information on investment decisions of the two case studies. Both case study firms use budgetary control through an accounting system to monitor these prominent measures under the financial perspective

Overall, both case study firms are moderately relying on level of debt, total asset growth and accounts payable level to evaluate their financial performance. Conversely, interest coverage ratio, current ratio, sales (turnover) growth rate and debt ratio were the least used financial performance measures by the two case study firms.

Case A places little attention in using level of receivables and level of debt (indebtedness) to evaluate its financial performance whereas Case B made extensive use of these same financial performance measures. This may imply that Case B is paying more attention to cash management and long-term financial solvency than Case A. Furthermore, total assets growth was an extensively adopted financial performance measure within Case A, in contrast to Case B.

Table 6.2 Summary of financial performance measures of the two cases

Financial performance measure	Extent of use by Case A	Extent of use by Case B	Consolidated
Profit or Net profit margin (%)	Extensively	Extensively	Extensively
Return on Investment	Extensively	Extensively	Extensively
Current ratio (times)	Least	Least	Least
Cash flow level	Extensively	Extensively	Extensively
Receivables level	Least	Extensively	Extensively
Sales (turnover) growth rate (%)	Least	Least	Least
Net profit growth rate (%)	Least	Least	Least
Level of debt (indebtedness)	Least	Extensively	Moderately
Debt ratio	Least	Least	Least
Interest coverage ratio (times)	Least	Least	Least
Total assets growth	Extensively	Least	Moderately
Accounts payable level	Least	Extensively	Moderately

6.3.1.1.2 Customer perspective

Table 6.4 summarises the results on the performance measures within the customer perspective of the two case study firms. The consolidated evidence showed that the level of customer satisfaction rating, level of repeat business from clients and number of new customers/clients are the three most extensively used measures by the two case firms. On consolidation of the findings, the two case study firms are moderating using customer or client growth and organization (corporate) image rating to evaluate their customer performance. Furthermore, number of customer improvement suggestions, number of complaints from customers and percentage of market share were the least used customer performance measures across the two cases.

Meanwhile, evidence illustrated that Case A is extensively using organization (corporate) image rating to evaluate its customer performance; in contrast, case B is moderately using this corporate image as a customer performance measure.

Table 6.3 Summary of customer performance measures of the two cases

Customer performance measure	Extent of use by Case A	Extent of use by Case B	Consolidated
Customer or client satisfaction rating	Extensively	Extensively	Extensively
Number of complaints from customers	Least	Least	Least
Number of new customers/clients	Extensively	Extensively	Extensively
Customer or client growth	Moderately	Moderately	Moderately
Number of customer improvement suggestions	Least	Least	Least
Percentage of repeat customers/clients	Extensively	Extensively	Extensively
Percentage of market share	Least	Least	Least
Organization (corporate) image rating	Extensively	Moderately	Moderately

6.3.1.1.3 Internal business process perspective

According to the consolidated results in table 6.4, the two case studies gave high priority to internal business process measures for their performance evaluation. Accordingly, they extensively used six performance measures to evaluate their internal business process performance. The six internal business process measures include response time to key quality and/or other business issues, level of defects or errors, processing time, level of risk (and safety), risk management responses and tender success rate. These customer performance measures covers a range of aspects within internal business process such as quality and process management.

Notably, the cross-case findings from the two case studies showed that the number of meetings was the only performance measure that was moderately used by both case study firms. On the same vein, Case B has been utilizing number of meetings extensively as an internal business process measure. Whereas, Case A has used it to a least extent. Based on the consolidated case findings, the least used internal business process performance measures include inter alia risk assessment review, level of reliability of deliveries, and time loss to accidents.

Table 6.4 Summary of internal business process measures of the two cases

Internal business process measure	Extent of use by Case A	Extent of use by Case B	Consolidated
Response time to key quality and/or other business issues	Extensively	Extensively	Extensively
Level of defects or errors	Extensively	Extensively	Extensively
Processing time	Extensively	Extensively	Extensively
% of expenses to total sales (turnover) revenue	Least	Least	Least
Tender success rate	Extensively	Extensively	Extensively
Construction productivity rate	Least	Least	Least
Accident rate/level	Least	Least	Least
Time loss to accidents	Least	Least	Least
Safety & health audit	Least	Least	Least
Number of risk management meetings	Least	Least	Least
Risk management responses	Extensively	Extensively	Extensively
Risk assessment review	Least	Least	Least
Risk scores for core construction business activities	Least	Least	Least
Level of risk (and safety).	Extensively	Extensively	Extensively
Level of punctuality of deliveries	Least	Least	Least
Level of Reliability of deliveries	Least	Least	Least
Number of meetings	Least	Extensively	Moderately

6.3.1.1.4 Learning and growth perspective

Consolidated findings from the interviews and document analysis in table 6.5 show that the two case studies are most extensively using five learning and growth measures to evaluate their learning and growth performance. They include level of IT applications in construction, employee competency (skills) coverage ratio, training hours per employee per year, employee productivity rate and investment in IT in construction for performance evaluation.

Both case study firms were moderately using employee satisfaction rating, recognizing and rewarding employees for outstanding performance, number of employee improvement suggestions and percentage of employees using computers in construction to assess learning and growth performance. Moreover, Case A has an established performance appraisal system and reward and recognition system including having annual award ceremonies to recognizing and award outstanding staff as a basis for motivating staff. Consequently, Case A has been making extensive use of recognizing and rewarding employees for outstanding performance. Meanwhile, Case B has begun to introduce a performance appraisal system and reward and recognition system to assess

staff performance and recognize their good achievements. As a result, Case B currently places little emphasis on recognizing and rewarding employees for outstanding performance and employee satisfaction.

Meanwhile, employee absenteeism rate, investment in leadership development and staff turnover were among the least applied learning and growth measures by the two case study firms.

Table 6.5 Summary of learning & growth measures of the two cases

Learning and growth measure	**Extent of use by Case A**	**Extent of used by Case B**	**Consolidated**
Employee satisfaction rating	Extensively	Least	Moderately
% of employee with degrees	Least	Least	Least
Training hours per employee per year	Extensively	Extensively	Extensively
Employee productivity rate	Extensively	Extensively	Extensively
Employee absenteeism rate	Least	Least	Least
Recognizing & rewarding employee for outstanding performance	Extensively	Least	Moderately
# of employee improvement suggestions	Least	Moderately	Moderately
Employee competency (skills) coverage ratio	Extensively	Extensively	Extensively
Investment in leadership development	Least	Least	Least
Investment in Knowledge management efforts	Least	Least	Least
Level of IT application in construction	Extensively	Extensively	Extensively
Investment in IT in construction	Extensively	Moderately	Extensively
% of employees using computers in construction	Moderately	Extensively	Moderately
Staff turnover	Least	Least	Least

6.3.1.1.5 Supplier perspective

Table 6.6 summarizes the results of supplier performance measures across the two case studies. According to the cross-case findings, percentage of on-time supplier deliveries, level of supplier's defect-free deliveries and level of contract compliance were the three most extensively used performance measure to evaluate supplier performance of the two case study firms. These findings suggested that both firms are demonstrating some interest in evaluating their supplier performance.

From cross-case findings, the two case studies moderately rely on supplier lead-time against industry norm and level of supplier relationship to evaluate their supplier performance.

Conversely, the two case firms applied the number of innovative suggestions from suppliers, level of supplier satisfaction and level of flexibility to a least extent for their performance evaluation. From an individual case analysis, Case A has been extensively relying on supplier lead-time against industry norm to assess its supplier performance, whereas case B has placed little emphasis on using this same measure to assess its supplier performance.

Table 6.6 Summary of supplier performance measures of two cases

Supplier performance measure	**Extent of use by Case A**	**Extent of use by Case B**	**Consolidated**
Level of supplier's defect-free deliveries	Extensively	Extensively	Extensively
Percentage of on-time supplier deliveries	Extensively	Extensively	Extensively
Supplier lead time against industry norm	Least	Extensively	Moderately
Level of supplier satisfaction	Least	Least	Least
Level of flexibility	Least	Least	Least
Number of innovative suggestions from suppliers	Least	Least	Least
Level of contract compliance	Extensively	Extensively	Extensively
Level of supplier relationship	Moderately	Extensively	Moderately

6.3.1.1.6 Project perspective

Table 6.7 summarizes the results of project performance measures across the two case studies. From the consolidated evidence, both case firms have placed extensive emphasis on performance measures under project perspective. Moreover, the cross case findings have shown that the two cases are extensively using six performance measures within the project perspective. They include quality of workmanship and product, client's satisfaction, level of project safety and risks, time of delivery against agreed standards, actual costs vs budgeted costs and project profit margin. These measures would assess the efficiency and effectiveness of construction projects of the case studies.

Project productivity rate was the least used project performance measure within the two case study firms. However, Case B places limited emphasis on using project productivity to assess project performance. Meanwhile, the cross case findings showed that functionality has been the least used project performance measure by the two case study firms.

Table 6.7 Summary of project performance measures of the two cases

Project performance measure	A-Mentioned by	B-Mentioned by	Total
Time of delivery against agreed standards	Extensively	Extensively	Extensively
Actual costs vs Budgeted costs	Extensively	Extensively	Extensively
Quality of workmanship and product	Extensively	Extensively	Extensively
Project profit margin	Extensively	Extensively	Extensively
Project productivity rate	Extensively	Least	Moderately
Client satisfaction rating of project	Extensively	Extensively	Extensively
Level of project safety & risks	Extensively	Extensively	Extensively
Functionality	*moderately*	*Least*	*Least*

6.3.1.1.7 Environment and community perspective

Table 6.8 summarizes the findings of environmental and community performance measures across the two case studies. Evidence from the two case studies revealed that level of environmental compliance was the most extensively used environmental and community measure by them. In addition, they have been utilizing the number of jobs created and contribution to the local community extensively to evaluate their performance. The cross-case findings showed that the two cases have been moderately using energy consumption and waste level to assess their environmental performance. Conversely, water consumption has been the least used environmental and community performance measures across the two cases.

Table 6.8 Summary of environmental & community performance measures of the two cases

Environment & community measure	A-Mentioned by	B-Mentioned by	Total
Level of environmental compliance	Extensively	Extensively	Extensively
Energy consumption	Least	Extensively	Moderately
Water consumption	Least	Least	Least
wastage and scrap rate/level	Least	Extensively	Moderately
Number of jobs created	Extensively	Moderately	Extensively
Contribution to the local community	Extensively	Moderately	Moderately

6.3.1.2 Objective 2: Identification of CSFs of the two Cases

The cross case findings of the two case firms revealed the CSFs across the seven identified performance perspectives. Table 6.9 presents results of cross case analysis for CSFs of case study firms. There appeared to be strong consistency in the CSFs identified among the case study firms. For the cross case study analysis, the importance of each CSF was designated as most (highly) important, moderately (somewhat) important or least important.

It can be seen from table 6.15 that there are ten (10) most important CSFs of the two case study firms. They include client or customer satisfaction, organizational competency, quality of service/product, project management, leadership, profitability, process management, resource availability and utilisation client relationships, and procurement and contract management. This means that managers of these case firms have been actively focusing on these CSFs in order to achieve their strategies and objectives.

Meanwhile, three CSFs are moderately important to the case study firms, namely risk management, supplier management and sustainability. It is important to draw attention to some CSFs that were not important to the case study firms. The least important CSFs among them include growth, employee learning and development, and client acquisition and retention. In contrast to Case B, financial stability was a significant CSF for Case A. Meanwhile, risk management was a CSF for Case B as compared to Case A.

Table 6.9 Summary of the CSFs of the two cases

#	Perspective	CSFs	Importance for Case A	Importance for Case B	Consolidated
1	Financial	Profitability	Moderately	Most	Most
		Liquidity	Least	Most	Moderately
		Growth	Least	Least	Least
		Financial stability	Most	least	Moderately
2	Customer	Client or customer satisfaction	Most	Most	Most
		Client relationships	Most	Most	Most
		Client acquisition/retention	Least	Least	Least
3	Internal business processes	Quality of service/product	Most	Most	Most
		Risk management	Least	Most	Moderately
		Process management	Most	Most	Most
		Maintenance management	Least	Least	Least
		Communication	Least	Least	Least
		Resource availability and utilisation	Most	Most	Most
		Integration of operations & processes	Least	Least	Least
4	Learning and growth	Employee learning & development	Least	Least	Least
		Organizational competency	Most	Most	Most
		IT Technology competency	Least	Least	Least
		leadership	Most	Most	Most
		Job security	Least	Least	Least
5	Supplier	Supplier management	Moderately	Moderately	Moderately
		Procurement/contract management	Most	Most	Most
6	Project	Project management	Most	Most	Most
7	Environment & community	Sustainability	Moderately	Moderately	Moderately

6.3.1.3 Objective 2: Target setting of performance measures of the two Cases

The cross case findings suggested that the case study firms have been establishing targets for their various identified key performance measures. This can imply that the case study firms are engaged in measuring and comparing their achieved performance against planned targets to identify and address any performance gap. The case results further noted that both case firms emphasize the importance of setting achievable targets.

6.3.1.4 Objective 2: Uses of performance measures of the two Cases

Generally, the cross case analysis indicated similar patterns across the cases for the use of performance measures in each category. However, some divergent patterns also prevail across the two case firms. The use of performance measures by the two cases is analyzed and presented under the following categories: measure performance, strategy management, communication, influence behaviour, learning and improvement and managing risks. They are now discuss below.

6.3.1.4.1 Measure performance use

Table 6.10 summarizes the results of the 'measure performance' use of performance measures of two study cases. The cross case findings showed that the two case study firms have been extensively using performance measures for monitoring their progress towards achieving objectives and evaluating their performance. Monitoring progress and evaluating performance would also involve inter alia the monitoring their resource usage, progress against strategic plans or business plans, performance monitoring, and monitoring and evaluating projects through their lifecycles. Furthermore, the cross-case findings revealed that the two case have been moderately using their performance measures for learning existing work practices.

Table 6.10 Summary of measure performance use of measures of the two cases

Measure performance	**Use of measure by Case A**	**Use of measure by Case B**	**Consolidated**
Monitoring progress towards achieving objectives	Extensively	Extensively	Extensively
Evaluating performance	Extensively	Extensively	Extensively
Learning existing work practices	Moderately	Moderately	Moderately

6.3.1.4.2 Strategy management use

Table 6.11 summarizes the usage of performance measures by the two case for strategy management. The cross-case findings showed that the two cases have been extensively using their performance measures for strategic decision-making, strategic planning, strategy implementation and managing strategic problems. These cross case findings suggest that strategy management usage is an important aspect of the case study firms for both their current and future directions.

Moreover, the two cases have been moderately using their performance measures for focusing attention on strategic aspects of business. Further, the combined evidence gathered from the cases suggested that their performance measures have been least used for managing strategic capabilities, managing strategic change and marketing.

From an individual case perspective, cross case evidence suggested that Case A has been using its performance measures extensively for focusing attention on strategic aspects of business. In contrast, Case B has been using performance measures to a limited extent for this same purpose. Furthermore, both Case A and Case B have placed little or no emphasis on using their performance measures for challenging strategic assumptions and plans.

Table 6.11 Summary of strategy management use of performance measures of the two cases

Strategy management	**Use of measure by Case A**	**Use of measure by Case B**	**Consolidated**
Strategic planning (formulation)	Extensively	Extensively	Extensively
Strategy implementation/execution	Extensively	Extensively	Extensively
Focusing attention on strategic aspects of business	Extensively	Least	Moderately
Strategic decision making	Extensively	Extensively	Extensively
Managing strategic capabilities	Least	Least	Least
Managing strategic change	Least	Least	Least
Challenging strategic assumptions	0	0	0
Managing/solving strategic problems	Extensively	Extensively	Extensively
Marketing	Extensively	Least	Least

6.3.1.4.3 Communication use

Table 6.12 summarizes the communication use of performance measures within the two case studies. According to the consolidated evidence, the managers of the two cases have been extensively using performance measures of the cases for internal communication to management

and employees at all levels, external communication to other stakeholders and communicating compliance with regulations to regulators. These cross case findings are not surprising as internal and external communications are not only important management activities that support the building and maintaining of mutual relationships with key stakeholders, but are important for effective decision-making.

In contrast, cross-case findings showed that the two cases have been making little use of performance measures for communicating benchmarking within themselves. Furthermore, Case A has been moderately using its performance measures for communicating between head office and divisions, whereas Case B is rarely using its performance measures for this purpose.

Table 6.12 Summary of communication use of performance measures of the two cases

Communication	Use of measure by Case A	Use of measure by Case B	Consolidated
Internal communication to management & employees at all levels	Extensively	Extensively	Extensively
External communication to other stakeholders	Extensively	Extensively	Extensively
Benchmarking (comparing) with other firms	Least	Least	Least
Compliance with regulations to regulators	Extensively	Extensively	Extensively
Communication between head office and divisions	Moderately	Least	Least

6.3.1.4.4 Influence behaviour use

Table 6.13 shows the results of the use of performance measure for influence behaviour within the two case studies. It is evident from cross case analysis that the two case study firms have been extensively using performance measures for managing relationships and cooperation and coordination under the influence behaviour use category. In addition, performance measures of the case study firms have been used to a moderate extent for monitoring behaviour and role understanding. Moreover, the performance measures of the two case firms have been least used for the motivation of organizational members, rewarding or compensating behaviour and staff turnover management. It is surprising that the two cases have not given prominence to motivation of organizational members as an important use of their performance measures since motivation is a vital driver of organizational performance.

Cross case evidence shows that performance measures in Case A have been used extensively for monitoring behaviour, in contrast the performance measures in Case B are rarely used for this same purpose. Meanwhile, cross case evidence suggested that Case B is in the process of introducing a performance appraisal system and associated performance measures in the immediate future to monitor effectively the behaviour of its staff. This would allow Case B to link pay and rewards to performance and work towards fulfilling its objectives.

Table 6.13 Summary of influence behavior use of performance measures of the two cases

Influence behaviour	**Use of measure by Case A**	**Use of measure by Case B**	**Consolidated**
Monitoring behaviour via performance appraisal	Extensively	Least	Moderately
Motivation of organizational members	Least	Least	Least
Role understanding	Moderately	Moderately	Moderately
Cooperation and coordination	Extensively	Extensively	Extensively
Rewarding or compensating behaviour	Least	Least	Least
Managing relationships	Extensively	Extensively	Extensively
Staff turnover management	Least	Least	Least

6.3.1.4.5 Learning and improvement use

Consolidated evidence showed that performance improvement and performance feedback are the most significant uses of performance measures within the learning and improvement use category of the two cases. The performance measures of the case firms have been utilised to a moderate extent for improving the firm's reputation and double-loop (high level) learning. Besides benchmarking practices, performance measures of the two case firms have been least used for enhancing accountability. These cross case findings may imply that benchmarking is rarely practice by the two study firms. Furthermore, the findings may suggest that the two case study firms have not adopted a set of performance measures and standards for benchmarking to achieve continuous improvement and learning. Overall, some improvements and learning are occurring in the two case firms with the use of their performance measures. Table 6.14 shows the learning and improvement use of performance measures of the two case firms.

Table 6.14 Summary of learning & improvement use of measures of the two cases

Learning and improvement	Use of measure by Case A	Use of measure by Case B	Consolidated
Performance feedback information	Extensively	Extensively	Extensively
Double-loop (high level) learning	Moderately	Moderately	Moderately
Performance improvement	Extensively	Extensively	Extensively
Improving firm's reputation	Extensively	Least	Moderately
Enhancing accountability	Least	Least	Least
Benchmarking practices	Least	Least	Least

6.3.1.4.6 Managing risk use

Table 6.15 shows the managing risk use of the performance measures of the two cases. The consolidated case evidence revealed that performance measures of the two cases have been used extensively for managing project risk and operational risk. The significant use of performance measures in the case studies for managing project risk is justifiable since they are project-based firms that would focus on assessing unforeseen events and their consequences on their planned project objectives. Furthermore, both study firms have been involved extensively in large complex construction projects and therefore project risk management would be critical for the realisation of their project success. Moreover, the two case study firms are using performance measures to a moderate extent for managing financial risk. On the other hand, the case study firms are using their performance measures to a little extent for managing strategic risk.

Table 6.15 Summary of managing risk use of measures of the two cases

Managing risks	A-Mentioned by	B-Mentioned by	Total
Strategic risk	Least	Least	Least
Operational risk	Extensively	4 Extensively	Extensively
Financial risk	Moderately	Moderately	Moderately
Project risk	7 Extensively	5 Extensively	12 Extensively

6.3.2 Objective 3 Development of performance measures across the two cases

According to the cross case findings, performance measures of the case firms have been derived largely from the strategy development process and CSFs. To some extent, they have been developing their performance measures from existing frameworks such as KPIs and industry standards.

6.3.3 Objective 4: Types of PMM is use in the two cases

Consolidated evidence suggests that both case firms their own internally developed PMM frameworks to measure and evaluate their performance. Both case firms do not prescribed to any well-established CPMM framework but utilised some aspects from them, in particular KPI framework.

Generally, PMM frameworks of the cases are being integrated partially with other management systems. Firms having a fully integrated PMM system is expected benefit from improved customer satisfaction, improved compliance with legislation and regulations. Meanwhile, the PMM framework of Case A is integrated to some extent with its point of sales system; HR management system; and business development and marketing system. At Case B, PMM framework is to some extent integrated with HRM system.

6.3.4 Objective 5: Barriers to the implementation of a CPMM framework

The two case firms recognized the importance of identifying the major barriers for the successful implementation of a CPMM framework within them. They tend to focus more in the internal organizational barriers compared to external barriers.

6.3.4.1 Internal barriers to CPMM framework implementation

The consolidated case evidence (see table 6.16) identified inappropriate organizational culture, lack of knowledge and understanding of the concept of PMM, lack of understanding of the expected benefits from CPMM framework, resistance to change, and staff complacency as the five most important internal barriers to the successful implementation of a CPMM framework within the two case study firms. Notably, inappropriate organizational culture was identified as the most important barrier from the consolidated case evidence. This finding implies that the case study firms must review their organizational culture and develop an appropriate one that supports the successful implementation of a CPMM framework. Furthermore, the consolidated evidence revealed inappropriate organizational culture was attributable to a range of factors including the difficulty in establishing a culture of performance excellence in Saint Lucia construction industry, conservative attitude towards upholding existing practices and a defensive culture.

Furthermore, lack of top management support emerged from the consolidated case findings as a moderately important internal barrier to the successful implementation of a CPMM framework. This is in contrast to the evidence drawn from the extant literature that shows lack of top management support as one of significant barriers to CPMM framework implementation success. Meanwhile, Case B considered poor communication practices and lack of coordination across departments as important barriers to the implementation of a CPMM framework. In contrast, Case A considered these same barriers as least important.

Further, cross case findings indicated inter alia that lack of employees' involvement and participation, inadequate resources for CPMM framework implementation, insufficient time to the implementation process, lack of reward and incentive system for workers, lack of clear strategies and/or strategic alignment and management styles were the least important internal barriers. With regard to the lack of employees' involvement, the finding implies that employees of the case study firms would not have any major issues in participating in the implementation of a CPMM framework. Furthermore, the case study firms perceived that resources are a hindrance to CPMM framework implementation.

6.3.4.2 External barriers to CPMM framework implementation

Environmental uncertainty influence (is barrier or an enabler to) the implementation of a PMM framework within business organizations. Therefore, it is imperative to assess the level and different types of environmental uncertainty that may inhibit the successful PMM framework implementation. Consolidated findings (see table 6.16) from the case studies indicated that the most important external (or environmental) barrier that would inhibit the successful implementation of a CPMM framework in the two case firms was external political uncertainty, the only environmental uncertainty. This implies that a high level of perceived or experienced external political uncertainty will halt or postpone the implementation of a CPMM framework. There was consensus from both case studies that the recent change in the government in Saint Lucia will increase the perceived external political uncertainty. Moreover, economic downturn/uncertainty was a moderately important barrier to the successful implementation of a CPMM framework within the cases.

The least important barriers to the implementation of a CPMM framework within case studies include social and ecological uncertainties, reluctance to adopting new technologies and low level of competition. This means that the case study firms perceived that they are not highly exposed to competitive pressures from within the construction industry, social changes and technological uncertainty.

Table 6.16 Barriers to the implementation of a CPMM framework of the two cases

Barriers to the implementation of a CPMM Framework	Importance By Case A	Importance By Case B	Consolidated
Internal factors			
Lack of top management support	Moderately	Moderately	Moderately
Lack of employees' involvement & participation	Least	Least	Least
Lack of knowledge & understanding of the concept of PMM	Most	Most	Most
Ambiguity or lack of understanding of the expected benefits from CPMMF	Most	Most	Most
Higher implementation costs	Least	Least	Least
Inadequate resources for CPMMF implementation	Least	Least	Least
Inadequacy of appropriate IT infrastructure support	Least	Least	Least
Lack of clear strategies &/or strategic alignment	Least	Least	Least
Business/firm size	Least	Least	Least
Inappropriate organizational culture	Most	Most	Most
Lack of reward & incentive system for workers	Least	Least	Least
Staff complacency	Most	Most	Most
Insufficient time to the implementation process	Least	Least	Least
Poor communication practices	Least	Most	Least
lack of coordination between departments	Least	Most	Least
Resistance to change	Most	Most	Most
Leadership/management styles	Least	Least	Least
Inappropriate organizational structure	Least	Least	Least
External factors			
Low Level of competition uncertainty	Least	Least	Least
Legislation & regulation in the industry	Least	Least	Least
Reluctance to adopting new technologies	Least	Least	Least
Economic downturn/uncertainty	Moderately	Moderately	Moderately
Political uncertainty	Most	Most	Most
Social & ecological uncertainties	Least	Least	Least

6.3.4.3 Strategies to overcome barriers to CPMM framework implementation

The cross case findings (see table 6.17) showed that education and training, leadership and top management commitment, a supportive culture for PMM, and gaining people's buy-in and involvement in a CPMM framework implementation process were the four most important

strategies that could be deployed to overcome the barriers to the successful implementation of a CPMM framework within the case studies. According to the interview findings, the provision of education and training would enable managers and other users to understand PMM concepts, and the effectiveness and operationalization of the CPMM framework. Furthermore, there is a need for education and training to facilitate the necessary behavioural changes within the case studies.

From cross case findings, both cases revealed that the commitment of leadership and top management was critical for ensuring the allocation of adequate time and resources to implementation of a CPMM framework. Not surprisingly, the case study evidence revealed that a supportive culture for PMM because was an important strategy as it could create the right attitude and behaviour to make CPMM framework implementation successful.

On the other hand, the two case studied provided evidence that aligning rewards to performance measures and targets, and making PMM an integral part of the firm's strategic planning are moderately important strategies to overcome barriers to the successful implementation of a CPMM framework. Evidence from the two case firms revealed that an appropriate implementation plan, clear organizational strategy and goals, and an appropriate ICT infrastructure, increase accountability throughout the organization were the least important strategies to overcome barriers to the CPMM framework implementation success.

The cross case findings revealed some differences between the cases. For example, compelling evidence from Case A showed that making PMM an integral part of the firm's strategic planning was an important strategy for successful CPMM framework implementation. Whereas, evidence from Case B provided very limited support for this strategy. This case finding suggests that the managers of Case A believed more in strategic alignment for the successful implementation of CPMM framework, compared to Case B. This would help managers of Case A to adequate plan the implementation and address emerging issues during the implementation.

Table 6.17 Strategies for CPMM framework implementation of the two cases

Strategies to overcome barriers to the implementation of a CPMM Framework	Importance to Case A	Importance to Case B	Consolidated
Leadership & top management support/commitment	Most	Most	Most
Gaining people's buy-in and involvement in a CPMM framework process	Most	Most	Most
Education & training	Most	Most	Most
A supportive culture of PMM within the organization	Most	Most	Most
Increase accountability throughout the organization	Least	Least	Least
Aligning rewards to performance measures	Moderately	Moderately	Moderately
Establishing a dedicated PMM team and allocated resources	Least	Least	Least
Appropriate ICT infrastructure	Least	Least	Least
Making PMM an integral part of Firm's strategic planning	Most	Least	Moderately
Clear organizational strategy and goals	Least	Least	Least
Appropriate implementation plan	Least	Least	Least

6.3.5 The need for a CPMM framework in the Saint Lucian industry

The cross case findings revealed that there is need to operationalize a CPMM framework within Saint Lucian construction firms and the industry as a whole in order to better evaluate their performance. Further, it is imperative that the CPMM framework is simple, easy to implement and use within the Saint Lucian construction firms. Moreover, the CPMM framework should be tailored to the needs and circumstances of Saint Lucian construction firms and to be sufficiently integrated with other management systems.

6.3.6 Recommendations for improvement of PMM practices suggested by the two cases

The cross-case findings identified some key ways that Saint Lucian construction firms can utilize to improve their PMM practices. They include the following: (1) Increase knowledge and understanding on PMM in construction; (2) Top construction managers should make CPMM a strategic priority. (4) Promoting a performance management culture; (3) Greater integration of their existing PMM framework with other management systems or sub-systems using appropriate ICT; (5) Conversion of existing PMM framework to a CPMM framework, which would be used to better evaluate their performance. However, no evidence was provided regarding a review of existing performance measures or PMM frameworks. Furthermore, case evidence suggested that the case firms should adopt an incremental approach to facilitate the improvement of the existing PMM framework.

Chapter 7 Discussion of research findings

7.1 Introduction

This chapter presents the discussion of the key results of this study from the quantitative and qualitative analyses. It is presented according to research objectives.

7.2 Key findings of the study

7.2.1 Objective 1: The importance of PMM

The study reveals that PMM is important to business organizations for achievement of their objectives. In particular, PMM has been applied both conceptually and in practice for performance evaluation and comparison of construction organizations. Further, the literature reviews shows that PMM in construction has been approach from three levels of performance, namely organization level, project level and industry level performance. Project performance has been the most highly emphasized level of PMM in construction in the literature. Further, PMM in construction has been discussed from a single organizational performance such as safety in construction and multi-dimensional organizational performance.

Based on the literature review, business and construction organizations are beginning to place greater emphasis on using CPMM frameworks to evaluate their performance. A typically CPMM framework comprises a financial and non-financial performance measures, CSFs and performance targets that are explicitly or implicitly align with organizational strategic objectives. The BSC has been observed as the most widely used CPMM framework by business organizations. In construction, the BSC, KPI and EFQM excellence model are the most widely used CPMM frameworks. Moreover, construction organizations have modified these major PMM frameworks to suit their circumstances. In same vein, the literature claims that these major frameworks have assisted construction firms to achieve performance excellence and improve their competitiveness and performance.

Furthermore, the literature review claims that the development of a CPMM framework should be considered from a life cycle approach of design, implementation, use and review of the system.

This suggests that considerable attention would be given to the multidimensional aspects and issues of performance and PMM frameworks of business organizations. Further evidence from the literature review shows that greater focus has been placed of the designing phase of CPMM framework. According, several conceptual frameworks were designed for the evaluation of performance in construction.

Business organizations are using their performance measures for several different purposes depending on their circumstances. Some of the important use of performance measures including evaluating performance, strategy management and communication.

The literature review reveals that there are several internal and external factors that can be considered as barriers or facilitators to the successful CPMM framework implementation in business organizations. Some of key factors include top management support and leadership, training and education, employees' involvement, resources and organizational culture.

7.2.2 Objective 2: Extent to which performance is being measured and use of measures

7.2.2.1 Performance measures used by St. Lucian construction firms

The research has classified performance measures in accordance with seven (7) BSC perspectives namely financial, customer, internal business process, learning and growth, project, supplier and environment and community perspectives. Evidence suggests that these seven perspectives are relevant to Saint Lucian construction firms. The findings of the study identify relevant performance measures utilised by Saint Lucian construction firms to assess their performance under these perspectives. This resulted in a BSC-based framework for PMM in construction (see section 8.1).

Moreover, the findings from both quantitative and qualitative phases of the research indicate that the Saint Lucian construction firms are deploying a wide range of both financial and non-financial performance measures to evaluate their performance. Some authors (Halman and Voordijk, 2012;

Baird and Su, 2018) reported similar findings. This implies that Saint Lucian construction firms are apply a high diversity of performance measures in the PMM frameworks to assess their performance. Accordingly, they could direct efforts and attention toward the achievement of their strategic priorities and objectives (Dekker et al., 2013; Bedford et al., 2018). Moreover, several studies (e.g. Franco-Santos et al., 2012; Hoque, 2014) found that the use of a diverse range of performance measures provides a more balanced view of organizations' performance and contributes to their effectiveness (e.g. improved performance). The diversity of performance measures may reflect the use of a wide range of construction related business activities to evaluate the firms' performance (Bedford et al., 2018) as well as reflecting the interest of the firms' key internal and external stakeholders.

Strong evidence from the study revealed that performance measures within the project perspective and internal business process are most widely deployed within Saint Lucian construction firms compared to the other perspectives. This finding is not surprising since construction firms are project based organizations. Furthermore, this finding is in line with the findings of Deng (2015). However, this finding contrasts with those in some previous studies conducted in other developing countries (Halman and Voordijk, 2012; Abdallah and Alnamri 2015; Pungchompoo and Sopadang 2015), that found financial performance measures were predominantly used to evaluate the performance of business organizations. In Addition, the evidence from quantitative phases of the study shows that the second most important perspective to Saint Lucian construction firms is environmental and community perspective. Meanwhile the qualitative phase of the study illustrates that the second most important perspective to Saint Lucian construction firms was the internal business process perspective.

7.2.2.1.1 Financial perspective

According to both quantitative and qualitative findings of the study, performance measures with financial perspective were considered important by Saint Lucian construction firms. The five (5) most extensively used financial performance measures to assess the financial performance of Saint Lucian construction firms were profit margin (a measure of profitability), cash flow level (a measure liquidity), return on investment, receivables level, level of debt and net sales growth rate.

These widely used financial measures by Saint Lucian construction firms focus on aspects of their profitability, short-term solvency and liquidity, long-term solvency and stability and financial risk.

Not surprisingly, these findings show that the financial perspective is important to Saint Lucian construction firms for their performance evaluation. These findings are in line with that of the construction management literature, which supported the incorporation of the financial perspective within a BSC (Yu et al., 2007; Luu et al., 2008; Chan, 2009; Ali et al., 2013; Jin et al., 2013) to evaluate the performance of construction firms.

These findings support some previous studies that considered measures of liquidity (Ali et al., 2013; Horta et al. (2012; 2013) and profitability (Tsolas, 2011; Ali et al., 2013; Horta et al., 2012; 2013; Ercan and Koksal, 2016; Hu and Liu, 2016) as critical for the survival and success of construction firms as well as for maintaining their competitive edge. Moreover, return on investment emerged as an important financial performance measure in the study of Vij and Bedi (2016). Furthermore, the high priority afforded to the monitoring of debt level is not surprising as a high level of debt can create financial risk for a construction firm and might eventually lead to its demise.

According to the study findings, sales (turnover) growth rate was the least used performance measure to evaluate the financial performance of Saint Lucian construction firms. This finding is contradictory with that of Vij and Bedi (2016), who found sales growth as a one of most important financial performance measure of business organizations.

7.2.2.1.2 Customer perspective

Within the customer perspective, the five (5) most extensively adopted measures by construction firms in Saint Lucia were customer satisfaction rating, percentage of repeat business customers, organizational (corporate) image rating, number of new customers/clients and customer/client growth. These findings concur with that of the construction management literature, which found that the financial perspective within a BSC (Yu et al., 2007; Luu et al., 2008; Chan, 2009; Ali et al., 2013; Jin et al., 2013) is important for evaluating the performance of construction firms.

Like this study, the high significance of customer satisfaction for the survival and success of construction firms has been highlighted in other construction related studies (Myeda et al, 2011;Ali et al., 2013; Deng, 2015; Koleoso et al., 2017) as well as in management related studies (Shaik and Abdul-Kader, 2012; Vij and Bedi, 2016). Furthermore, the extensive use of repeat business with existing customers and clients may be a reflection of their satisfaction with the firms' products and services (Nassar and AbouRizk, 2014).

The important use of corporate image rating is justified since corporate image and other intangibles such as brand and reputation are important performance drivers and are key sources of competitive advantage in the marketplace (Pedersen and Sudzina, 2012). The extent of use of corporate image was considered high in some other studies (Khan et al., 2011; Halman and Voordijk, 2012; Shaik and Abdul-Kader, 2012). Contrary to that, it was used moderate by Case B and it was among the least used measures in the study of Deng and myth (2013).

Furthermore, the research findings suggest that percentage of market share and number of customer improvement suggestions were least used by Saint Lucian construction firms. This suggests that construction firms in Saint Lucia are not placing much emphasis on monitoring and improving their market share as basis of knowing and increasing their competitive position in the construction market, which is inconsistent with the findings of previous literature (Waweru, and Spraakman, 2012; Vij and Bedi, 2016). It may also imply that there are difficulties in obtaining the some of the data to calculate market share. Therefore, the market leaders may attempt to predict the market share informally. Furthermore, these findings may imply that construction firms in Saint Lucia are not placing considerable emphasis on the importance of translating customers' suggestion into continuous improvement in organizational performance (Dimitropoulos et al., 2017).

7.2.2.1.3 Internal business process perspective

The seven (7) most extensively used performance measures to evaluate the internal business process performance of Saint Lucian construction firms include response time to key quality and/or other business issues, level of defects or errors, processing time, level of risk and safety, risk management responses, tender success rate, construction productivity rate and percentage of

expense to sales. These findings reflect that internal business process perspective is of particular importance to Saint Lucian construction firms in terms of achieving operational efficiency and business innovation (Jin et al., 2013). Moreover, these findings are consistent with the findings of previous studies by construction management researchers (Yu et al., 2007; Luu et al., 2008; Chan, 2009; Jin et al., 2013) who found support for the internal business process perspective within their proposed a balanced scorecard framework for evaluating the performance of construction firms.

Furthermore, these findings imply that the important internal process performance measures are seem to align with the expectations of customers and other key stakeholders (Anjomshoae et al. (2017). These findings corroborate with that of the study of Meng and Minogue (2011) who found response time as one of most important performance measures in the studied organizations. Anjomshoae et al. (2017) suggest that organizations should focus on the speed of response to quires and business issues.

Furthermore, the findings are consistent with that of some other authors (Baird and Su, 2018; Sangwa and Sangwan, 2018) who found that the defect rate/level was among the important quality performance measures of the studied business organizations. Moreover, the level of defects would assess the quality of a construction project (Hwang et al., 2013) and other products and services within construction firms. Furthermore, the qualitative phase of this study demonstrated that importance of monitoring the level of defects or errors to ensure that it is within acceptable level. This would minimise change orders, reduce corrective actions, reduce rework, reduce cost, and ultimately improve the quality of products and services of Saint Lucian construction firms. Accordingly, it is necessary that construction firms place emphasis on adequate planning and improving their current internal business processes to reduce defect levels.

7.2.2.1.4 Growth and learning perspective

According to the research findings, Saint Lucian construction firms have used extensively seven measures to evaluate their growth and learning performance. The seven growth and learning performance measures include employee skills/competency coverage ratio, training hours per employee per year, employee productivity rate, employee satisfaction rating, level of IT/ICT application in construction, investment in ICT in construction, and percentage of employees using

computers in construction. This shows that growth and learning perspective is vital and useful to Saint Lucian construction firms for evaluating their performance. These findings are consistent with the findings of previous studies by construction management researchers (Yu et al., 2007; Luu et al., 2008; Chan, 2009; Jin et al., 2013) in which the learning and growth perspective received support for inclusion in their proposed BSC for the evaluation of construction firms.

This is contrary to the findings of some construction management researchers (e.g. Kagioglou et al., 2001. Ali et al., 2013), who found no support for the learning and growth perspective in their studies. This may be due to limitation of organizational learning and innovation within the construction industry because project management teams are usually temporary and its conservative and fragmented nature (Jin et al., 2013).

Furthermore, the high prominence given employee competency ratio as a learning and growth performance measure in this study is not surprising as high levels of employee skills and competencies that resonate within construction firms would most like improve individual and organizational performance. Consistent with the findings of some construction management researchers (Yu et al., 2007; Luu et al., 2008; Jin et al., 2013), this study reveals that the level of IT application in construction was also perceived by managers as highly important for measuring and evaluating the learning and growth performance of Saint Lucian construction firms. It has been widely acknowledged that the successful application of IT in construction would enable construction firms to benefit from the achievement of sustainable organizational performance and competitive advantage in the marketplace (El-Mashaleh et al. 2006; Jacobsson and Linderoth, 2012; Sepasgozar, Loosemore and Davis, 2016). In addition, IT application in construction could enhance the adoption of a range of industry best practices (Kang et al., 2013).

7.2.2.1.5 Supplier perspective

From the findings of both quantitative and qualitative phases of the research, seven performance measures emerged as the most extensively used measures by Saint Lucian construction firms to assess their supplier performance. These supplier performance measures include percentage of on-time supplier deliveries, level of supplier's defect-free deliveries, level of contract compliance, level of flexibility, level of supplier satisfaction, supplier lead-time against industry norm and

supplier relationships. This implies that supplier performance measures are of emerging importance to construction firms in Saint Lucia. These findings are consistent with the findings of the previous construction management study by Kagioglou et al. (2001) in which the supplier perspective got support for inclusion in their proposed a balanced scorecard framework. Furthermore, these findings support those by some authors who claim that supplier performance measures are pivotal to the overall organizational performance (Deng et al., 2012; Melnyk at el., 2014; Dey, Bhattacharya, Ho and Clegg, 2015) and could enhance an organization's competitive advantage (Gawankar, Kamble, and Raut, 2017).

The research findings identify on-time delivery with suppliers and level of supplier's defect-free deliveries as the two most important supplier performance measures used by Saint Lucian construction firms. This implies that Saint Lucian construction firms are placing considerable emphasis on delivery and quality performance of suppliers in terms of delivering supplies to them on time and defect-free (Maestrini et al. 2017). Moreover, the qualitative phase of the research suggests that construction firms should select reputable suppliers to ensure that deliver materials and components on time and defect-free.

Buyer-supplier relationship level was an important supplier performance measure that emerged from the research findings. This finding is consistent with that of the literature (e.g. Maestrini et al., 2018). Moreover, the finding suggest that Saint Lucian construction firms understand the significance of assessing buyer-supplier relationships in order to deliver quality products and services to the clients and customers. Moreover, the research findings suggest that construction firms should build and maintain good supplier relationships, as they would improve their operational efficiency and ultimately value. In addition to operational efficiency, Hudnurkar, Rathod, Jakhar and Vaidya (2018) suggest that business organizations should understand appropriate investment to strengthen supplier-buyer relationships in order to gain flexibility and sustainable competitive advantage.

Bemelmans, Voordijk, Vos and Buter (2012) suggest that effective and efficient management of buyer-supplier relationships in construction often involves selecting and developing suitable suppliers and ongoing monitoring of their performance. Furthermore, the qualitative phase of

research identities relationship networks and strategic alliances as two important methods of building strong buyer-supplier relationships.

7.2.2.1.6 Project perspective

As previously mentioned, significant evidence emerging from the study shows that saint Lucian construction firms are utilizing a wide range of performance measures to evaluate their project performance. Quality of workmanship and product, client's satisfaction, level of project safety and risks, time of delivery against agreed standards, actual costs vs Budgeted costs, project profit margin and project productivity were the seven (7) most extensively used project performance measures by Saint Lucian construction firms. These findings reveal that the Saint Lucian construction firms are moving beyond the traditional (iron triangle) measures of project performance and success in term of cost, time and quality to consider other measures such client satisfaction and productivity. This is consistent with the findings of some authors (Toor and Ogunlana, 2010; Rashvand and Majid, 2014; Ajmal, Malik and Saber, 2017) who observed that project based firms need to consider additional performance measures to the traditional measures in respect to time, cost, and quality to evaluate project performance and success.

These findings concur with the findings of the previous construction management study by Kagioglou et al. (2001) who found support for the supplier perspective within their proposed BSC to evaluate performance of construction firms. Moreover, these findings resonate with the findings of Idrus, Sodangi and Husin (2011) who found quality of finished project or product as the most important measure for evaluating project performance. In this study, quality workmanship and product identified as the most important project performance measure is justifiable since construction firms have to ensure that completed projects conform to established quality requirements of the clients and the end-users and consequently meet their satisfaction (Idrus et al., 2011).

The research findings further substantiate the previous findings of Ali and Rahmat (2010) who found that client's satisfaction as one of the most important measure of project performance of construction firms in Malaysia.

It is not surprising that level of project safety and risks was also regarded as an important project performance measure since construction projects are often exposed to high levels of risk. This project performance measure, therefore, should enable construction firms to capture risk and safety information that would assist them to manage risks of projects effectively (Perrenoud et al., 2014). Evaluating and managing risks in construction projects especially at the enterprise level would add value to their delivery and improve efficiency (Liu, Zou, and Gong, 2013) and facilitate strategic project formulation (Marcelino-Sádaba et al., 2014). It was further observed in the study that delays in payments and variations are key risks of construction projects, a finding which is consistent with the results of the previous study of Rostami and Oduoza (2017).

7.2.2.1.7 Environment and community perspective

Perhaps the most interesting finding from this study is that Saint Lucian construction firms recognize the importance of environmental and community performance measures for evaluating their performance. More specifically, the findings of the study reveal that construction firms in Saint Lucia are mostly using six (6) measures to assess their of environmental and community performance. They include level of environmental compliance, number of jobs created, contribution to the local community, energy consumption, water consumption and waste level. The inclusion of environmental and social performance measures for the performance evaluation of Saint Lucian construction firms show that they are recognizing the importance of evaluating sustainability performance and non-financial aspects of performance (Tuni, Rentizelas and Duffy, 2018) and corporate social responsibility (Gadenne et al., 2012).

The high prominence accorded to environmental compliance measure is not surprising as it allows a firm to continuously monitor and compare its current environmental impacts against the legal and regulatory requirements (Shaik and Abdul-Kader, 2012; Ormazabal, Sarriegi and Viles, 2017). This finding is consistent with those in the studies of Meng and Minogue (2011) and Shaik and Abdul-Kader (2012).

Moreover, the findings suggest that managers of Saint Lucian construction firms believe that to build sustainable communities they should focus on jobs creation and contribution to the local community.

These results support the findings of Bezerra and Gomes (2016), who consider energy consumption; water consumption; waste level, number of jobs created and sponsorship or donations as important measures in their proposed PMM framework for airport businesses. However, these findings do not support those in Ali et al. (2013) who found energy consumption, water consumption, and waste as among the least utilised measures for assessing performance of construction firms.

Meanwhile, one notable difference in the observed findings is the water consumption measure. The survey results of this study show that Saint Lucian construction firms are widely using water consumption, whereas the multiple-case study finds that water consumption is the least used in the environmental and community perspective.

7.2.2.1.8 Discussion of factor analysis for performance measures used

The study classifies through factor analysis the performance measures used by Saint Lucian construction firms into seven components (factors) namely: employee and customer perspective, supplier perspective, business efficiency and growth perspective, project perspective, innovative technology perspective, environmental perspective, environmental perspective, and internal process management perspective. These findings from the factor analysis were generally consistent with the literature (e.g. Salleh, Jusoh and Isa, 2010; Lin 2015), but were not fully consistent with the questionnaire design. The results demonstrate that employee and customer perspective appears to be the most important aspect of performance within the Saint Lucian construction industry.

The results of the factor analysis (PCA) reveal that supplier perspective, project perspective and environmental perspective (which excluded the community aspects) were similar to the initial CPMM conceptual framework. The results of the factor analysis confirm the findings of some authors (Kagioglou et al., 2001), who found the supplier and project principal components are crucial to the overall performance of constructions firms and included them a conceptual framework.

Surprisingly, the results of the factor analysis further indicate that only two performance measures from the financial perspective of the initial conceptual framework were retained and loaded on components, 1 and 4. Therefore, there was no component was generated for the financial perspective. The results also suggest that Saint Lucian construction firms recognize the high importance of non-financial performance measures to achievement of their objectives. This may be as result of the increasing competition and political and economic uncertainties in Saint Lucian construction industry. Furthermore, these findings are contrast to the findings of Salleh, Jusoh and Isa (2010) who found that financial based measures was an important principal component.

In addition, the growth aspect of the learning and growth perspective from the questionnaire design was extracted as a single component. The constituent of the learning aspect was loaded onto other components. Similarly, environmental aspect of the environmental and community prospective was extracted as a separate component.

7.2.2.2 CSFs of Saint Lucian construction firms

The findings of this study identifies ten (10) CSFs as follows: client or customer satisfaction, organization competency, quality of service/product, project management, leadership, profitability, process management, resource availability and utilisation, client relationships, and procurement and contract management. These findings are largely consistent with literature.

For instance, this research findings support the results of many prior studies that found client or customer satisfaction as one of the most important CSFs for business organizations' success (Ali and Rahmat, 2010; Oyewobi et al., 2015; Ofori-Kuragu, Baiden and Badu, 2016). The study by Ofori-Kuragu, Baiden and Badu (2016) identified eight CSFs for construction related firms including quality and zero defeat culture, client/customer satisfaction and leadership. In a proposed integrated construction excellence model, Oyewobi et al. (2015) regarded client satisfaction as the most important performance criteria (or CSFs) for construction firms.

These results further supported the findings of Yu et al. (2007) who recognized organization competency within the learning and growth perspective of their proposed PMM framework as a CSF or performance criteria for construction firms. Moreover, the research findings identify

employee competencies, top management competencies and other work related competencies as three key sub-factors of organization competency. In a same vein, Isik, Arditi, Dikmen and Birgonul (2010) found that project management competencies is an important CSF of construction firms in Turkey.

Consistent with the results of this study, some studies (Ali et al. 2013; Willar et al., 2015) found that quality of service/product to be an important CSF or performance criteria of construction firms in Saudi Arabi.

Evidence from the qualitative phase of the research reveals that risk management was a significant CSF for Case B, whereas it was insignificant for Case A. This may suggest that Case A is a large firm with more resources and therefore is less sensitive to the impacts of risks compared to B.

7.2.2.3 Target setting for performance measures

The research findings show that Saint Lucian construction firms are setting targets for their key performance measures. This implies that they can identify performance gaps between actual performance and planned performance. These findings are consistent with the literature (Speklé and Verbeeten, 2014; Wake, 2015; Jääskeläinen and Roitto, 2016). Jääskeläinen and Roitto (2016) suggest target setting for performance will enable business organizations to monitor their achievement of their goals and objectives.

7.2.2.4 Types of uses of performance measures

This study investigates the use of performance measures in construction firms in Saint Lucia. Koufteros et al. (2014) provide evidence to suggest that the use of performance measures could have an influence on the organizational performance. (Laihonen and Pekkola, 2016) suggest that the value of measuring performance emanates from the use of information generated by the performance measures. In the literature, many authors have encapsulated the types of uses or purposes of performance measures into different categories. Drawing from the typology proposed by Franco-Santos et al. (2007), the uses of performance measures in this study are analysed and presented into the following six categories: measure performance, strategy management, communication, influence behaviour, learning and improvement and managing risks.

The findings from both quantitative and qualitative phases of the research indicate that Saint Lucian construction firms are using their performance measures for a wide range of different purposes. This is largely consistent with previous empirical findings of Hourneaux Jr, et al. (2017). This finding may imply that Saint Lucian construction firms are making effective use of PMM frameworks.

An importance weighting was assigned to each use of performance measure in the overall study as follows: extensively used, moderately used or least (limitedly). The study identifies patterns, and evaluates similarities and differences between the quantitative and qualitative components under each category. The discussion for each usage category is provided sections below.

7.2.2.4.1 Measure performance use

Strong evidence shows that performance measures that are widely used by Saint Lucian construction forms for measuring and monitoring progress, evaluating performance and learning existing work practices. These findings imply that construction firms in Saint Lucia are focusing on the traditional practice/use of performance measures or PMM frameworks for measuring performance. This is consistent to with a large number of relevant studies on PMM in construction (e.g. Horta et al., 2010; Ali et al., 2013; Deng and Smyth, 2013; Jin et al., 2013) and in other studies (Cheng and Humphreys, 2016; Koleoso et al, 2017; Hourneaux Jr. et al. 2017). For example, Cheng and Humphreys (2016) suggest that managers of business organizations measure and track their performance against targets and make corrective actions when necessary, especially under conditions of high strategic uncertainty.

Generally, measure performance use is mainly associated with diagnostic use of PMM frameworks, which enables simple loop learning (Ferreira and Otley, 2009). As such, managers of an organization measure performance by evaluating and monitoring performance results against set objectives and targets as well as taking appropriate corrective actions in order to get the organization back on track towards the achievement of its objectives. In this regard, a PMM framework is deployed as a management control tool in the organization (Ferreira and Otley, 2009; Lehtinen and Ahola, 2010).

In this study, a difference was observed for the usage of learning existing work practices. The quantitative research suggests that Saint Lucian construction firms use performance measures extensively for learning existing work practices, whereas the qualitative research suggests that Saint Lucian construction firms use performance measures moderately for learning existing practices.

7.2.2.4.2 Strategy management use

Strong evidence shows that Saint Lucian construction firms make extensive use of performance measures for strategy management activities. More specifically, Saint Lucian construction firms identified strategic planning, strategy implementation, strategic decision-making, focus attention and managing strategic problems as the most important uses of their performance measures in the strategy management use category. These findings are consistent with other studies in the field of PMM (Lehtinen and Ahola, 2010; Bisbe and Malagueno, 2012; Pinheiro de Lima et al., 2013; Cheng and Humphreys, 2016).

Within strategy management use, putting strategic planning use of performance measures as top priority is justifiable. This is because strategic planning provides construction firms with the opportunity to identify and deploy actionable strategies and initiatives to achieve their mission, and reflect on the changing business environment and their position within it (Klag and Langley, 2014; Pasha and Poister 2017). In a same vein, this finding concurs with that of Alach (2017). Meanwhile, Suarez, Calvo-Mora, and Roldán (2016) suggest that strategic planning supports the long-term success and change of an organization. Furthermore, the results of the study is consistent with findings of Abdel-Maksoud et al. (2015) who found strategy implementation as main use of performance measures of business organizations.

The research evidence gives particular importance to the use of performance measures for decision-making. This was also evident from some previous studies (Moreira and Tjahjono, 2016; Sanchez et al. (2017) which found that managers of business organizations used performance measures in CPMM frameworks for decision-making. This would imply that the decision-making processes of saint Lucian construction firms seem to rely not only on tuition of managers but also on management information (Hourneaux Jr, et al., 2017).

The findings suggest performance measures of saint Lucian construction firms are least used for challenging strategic assumptions. This implies that Saint Lucian construction firms are utilising performance information to question and challenge assumptions about their plans (Marginson, McAulay, Roush and Zijl, 2014) and how their business operate in the market in order to assist them to identify problems and develop a greater number of solutions to address the problems (Hall, 2011). Further, Marginson et al. (2014) suggest encouraging continual challenge and debate of underlying assumptions and data within an on organization will ensure that the individual goals as well as corporate goals are met.

The result is somewhat surprising, because there is a perception that in most of the developing countries, there is a lack of effective strategy (or strategic) management in the construction industry (Luu et al., 2008; Murphy, 2013).

7.2.2.4.3 Communication use

The findings from the study present evidence that internal communication to management & employees at all levels, external communication to other stakeholders and communicating compliance with regulations to regulators are the most important uses of performance measures within the communication usage category. This imply that managers of Saint Lucian construction firms are applying performance measures to support both internal and external communications with stakeholders (Villa, Gonçalves and Odong, 2017). Effective internal and external communications play a critical role in improving coordination within Saint Lucian construction firm and ultimately their performance (Villa et al., 2017). Moreover, Saint Lucian construction firms place also great emphasis on building and managing relationships with internal and external stakeholders (see influence behaviour use), and effective communication would facilitate appropriate management of relationships to improve their performance (Villa et al., 2017).

Meanwhile, placing extensive emphasis on using performance measures for internal communication may be associated with the deployment of strategy throughout the entire Saint Lucian construction firms and assessing their progress against objectives and targets (Wake, 2015). Moreover, the findings also suggest that saint Lucian construction firms are placing emphasis on external communication, and thereby communicating their performance and other relevant issues

to their external stakeholders, such as investors, suppliers, and customers (Tätilä, Helkiö and Holmström, 2014). In addition, the findings emphasis communicating compliance with regulations to regulators as an important use of performance measures of Saint Lucian construction firms. This may stem from their active respond to the institutional pressures or isomorphism they face (Modell 2012; Akbar, Pilcher, and Perrin, 2015; Deng, 2015).

The overall evidence also suggests that construction firms are using performance measures moderately to communicate benchmarking information among units and with other firms. Communicating benchmarking information throughout the organization would provide a better understanding of the industry best practices and competition (Hesham and Magd, 2008). On the other hand, performance measures of Saint Lucian construction firms were least used for communicating between head office and divisions. This finding implies that the majority of constructions firms do not have established divisions.

7.2.2.4.4 Influence behaviour

According to the findings of the research, performance measures influence behaviours of individuals in the Saint Lucian construction firms. Within this category, performance measures of Saint Lucian construction firms are most extensively used for cooperation and coordination, and managing relationships.

The research findings coincide with those in other studies (e.g. Cousins et al., 2008; Franco-Santos et al., 2012) that found evidence that PMM frameworks are useful for fostering cooperation and coordination within and beyond the organizations. As suggested by some authors (e.g. Anjomshoae et al., 2017), fostering cooperation and coordination would improve service and product quality and ultimately organizational performance.

Putting high emphasis on using performance measures for managing internal and external relationships is not surprising, as good stakeholder relationships can provide mutual benefits to all concerned parties. The results of this research confirm the findings of some authors (e.g. Bemelmans et al., 2012; Lith et al., 2015) who found evidence that PMM frameworks are useful for managing relationships with internal and external stakeholders. These same authors found that

managing relationship of organization effectively with stakeholders such as customers and suppliers is critical means of achieving performance improvements (e.g. cost reduction). The recent study by Hudnurkar et al. (2018) found that a BSC-based framework could be used for enhancing relationships with suppliers, which could lead to competitive advantage. On the other hand, the research findings are contrary to that of other studies (Kunz, 2015; Maestrini, et al., 2018) that found evidence that PMM frameworks are least useful for managing relationships with stakeholders.

In the category of influence behaviour usage, quantitative phase of the study shows that performance measures of Saint Lucian construction firms are being least used for staff turnover management. Whereas, the quantitative phase reveal that they are least used for monitoring behaviour.

7.2.2.4.5 Learning and improvement

Within the learning and improvement use category, the most important uses of performance measures of Saint Lucian construction firms including improving firm's reputation, performance improvement, enhancing accountability, and performance feedback information.

Emphasis on improve reputation of firms in the market as an extensive use of performance measures by Saint Lucian construction firms is justified. This is because good reputation and image in the market are important intangible asset that provides long-term benefits to firms (Ullah et al., 2017) and organizational success (Liehr-Gobbers and Storck, 2011). Furthermore, organizational reputation is seem as an important way of gaining sustainable competitive advantage (Jim et al., 2013) and establishing trust (Öztürk, Arditi, Günaydın and Yitmen, 2016) in the construction market. Good reputation of a construction firm would increase its ability to maintain existing businesses, obtain new businesses and hence improve its performance.

Furthermore, the findings from the study are consistent with many prior studies (de Waal and Kourtit, 2013; Ercan and Koksal, 2016; Kärnä and Junnonen, 2016; Baird, 2017; Mehralian et al., 2017; Yuliansyah et al. 2017; Baird and Su, 2018) that found an important use of contemporary performance measures is to provide improvements in organizational performance and

effectiveness. More specifically, Baird and Su (2018) found evidence that the effectively use of performance measures improves organizational performance in specific operative processes and controls. In addition, Ercan and Koksal (2016) found evidence that the managers of construction firms can deploy contemporary performance measures or a CPMM framework to achieve competitive advantage and improved performance. Wilar (2017) suggests that to improve their performance in the execution of construction works, construction firms should use a CPMM framework. Furthermore, other researchers found evidence that the use of appropriate contemporary performance measures assists firms in improving their project management performance (Brookes et al., 2014) as well as stimulating quality improvement (Kärnä and Junnonen, 2016).

In line with the extant literature, the case study evidence shows that construction firms in Saint Lucia tend to focus on three aspects of performance improvements, namely process, quality and project management improvements. Furthermore, case study evidence shows that Saint Lucian construction firms mainly gain performance improvements via the use of modern construction equipment and technology, competent organizational members, and the resolution of performance problems.

According to the research findings, Saint Lucian construction firms moderately used their performance measures for double-loop (high level) learning. This finding is somewhat interesting as Saint Lucian construction firms perceived the need for a CPMM framework, which requires double loop learning for its success. Cheng and Humphreys (2016) argue that the use of performance measures for enabling double-loop learning is particularly important in condition of high strategic uncertainty. Ramish and Aslam (2016) emphasized the importance of double loop learning which involves questioning, critical reflection and modification of the normal behaviour and practices to bring about performance improvements within an organization. Importantly, Yadav, Taticchi and Sushil (2015) suggest that double loop learning is essential for fostering critical reflection, providing feedback and modifying an existing organizational PMM framework into a more effective PMM framework that would achieve higher performance

Research evidence shows that performance measures of Saint Lucian construction firms have been least used for benchmarking practices.

7.2.2.4.6 Managing risk use

The findings from both quantitative inquiry and multiple-case study confirm that managing risk is an important use of performance measures of Saint Lucian construction firms. These findings concur with that in the literature (e.g. Rostami and Oduoza, 2017). In contrast, the finding are different to that of Agyakwa-Baah and Chileshe (2010) who found low usage of contemporary performance measures by construction firms for managing risks. It was observe that construction managers need to pay attention to various risk factors within the ambit of construction risk to facilitate successfully organizational performance.

More specifically, the evidence from the study reveal that Saint Lucian construction firms are using their performance measures for managing project risk, operational risk and financial risk. These results are not surprising, as managing project risk is critical for the realisation of business and project objectives of construction firms (Perrenoud et al., 2017; Rostami and Oduoza, 2017). Several researchers (Jarkas and Haupt, 2015; Perrenoud et al., 2017) suggest effective project risk management is critical since there is often a high level of uncertainty found within construction projects. The research findings are contradictory to the results obtained by some researchers in developing economies (Kululanga and Kuotcha, 2010; Yirenkyi-Fianko and Chileshe, 2015), who observed low usage of project risk measures and processes within the construction firms. Kululanga and Kuotcha (2010) further observed that the low usage of project risk measures and process could lead to poor performance in the construction firms.

Additionally, the multiple-case study reveals the following salient project risk factors are likely to impact on the performance of construction firms in Saint Lucia: project specifications requirements, payment by the client, project complexity, resource availability, site information adequacy, design completeness and contract completeness. This finding is consistent to large extent with the literature (Jarkas and Haupt, 2015; Iqbal et al., 2015).

These findings are also justified, as construction firms would identify and manage operational risks in order to improve their operational and resource efficiency (Andersen, 2008; Marcelino-Sádaba et al., 2014). Furthermore, risks related to operational processes such as site management, compliance, health and safety, quality and resource management were identified in the qualitative multiple-case study.

Moreover, financial risk was also emphasised as an important use of performance measures of construction firms in Saint Lucia. This finding is not surprising given that financial stability and solvency are important issues that construction firms consider and monitor for their survival. Furthermore, the findings also substantiate the results obtained from previous studies (Anton et al., 201; Iqbal et al., 2015).

The literature emphasises the significance of managing strategic risk in order to reduce the uncertainty related to strategic choices and decisions (Smart and Creelman 2013, p.178). However, saint Lucian construction firms made least use of their performance measures to manage strategic risk. Therefore, the findings from this use category infer that Saint Lucian construction firms are paying limited to managing strategic risk.

7.2.2.4.7 Discussion of Factor analysis for the uses of performance measures

Within the customer perspective, the five (5) most extensively adopted measures by construction firms

Using the factor analysis, the study summarises the uses of performance measures by Saint Lucian construction firms into six principal components (factors). They include monitoring and evaluating use, strategy management use, managing risk use, governance and learning use, benchmarking use and rewarding and compensating behaviour use. Overall, the results of factor analysis were not fully consistent with questionnaire design or theoretical framework. Further, it has been observed that strategy management use and managing risk use were the two categories retained from the questionnaire design or theoretical framework.

The results of the factor analysis illustrate that monitoring and evaluating use category was considerable perceived to be the most important category (51.94% of TVE) within the Saint Lucian

construction industry. This Use category is similar to the operational use category proposed by Speklé and Verbeeten (2014). This finding implies that many construction firms in Saint Lucia are focusing of the traditional use of their performance measures.

Generally, the results the factor analysis for the use of performance measures by Saint Lucian construction firms were consistent with the literature (e.g. Speklé and Verbeeten, 2014; Falkner and Hiebl, 2015; Cheng and Humpreys, 2016; Hourneaux Jr, et al. (2017).

7.2.2.5 Objective 3: Development of performance measures used by construction firms

Strong evidence from both the quantitative and qualitative components of the study suggests that Saint Lucian construction firms derived performance measures from their strategy development process. This is consistent with the finding from the literature (e.g. Latiffi et al., 2010; Soderberg et al., 2011; Najmi and Makui, 2012; Jääskeläinen and Roitto, 2016; Alach, 2017; Yuliansyah et al., 2017). This is a significant finding, as the measures in a CPMM framework should be based on an organization's strategy development process (Kaplan and Norton, 2008; Najmi and Makui, 2012). Moreover, this may imply that Saint Lucian construction firms are implicitly or explicitly using aspects of their strategy development process in their PMM process.

Soderberg et al. (2011) suggest that business organizations can realize maximum benefits from the implementation of a PMM framework with performance measures derived and aligned with their goals and strategies. Some authors (Baird, 2017; Yuliansyah et al., 2017) argue that developing and selecting performance measures from the strategy process is likely to enhance organizational performance and effectiveness.

There was sufficient evidence to suggest that Saint Lucian construction firms using CSFs to develop their performance measures. This suggests that they are considering their key business areas to develop and select their performance measures. Furthermore, there is some evidence to suggest that Saint Lucian construction firms are developing their performance measures from existing PMM frameworks and industry standards. In a similar vein, Jin et al. (2013) emphasize the need for construction firms to review some existing conceptual models to select their performance measures that are more suited to the characteristics and circumstances.

There was weak evidence to suggest that performance measures of Saint Lucian construction firms were derived from the need of their stakeholders. This contrary to study of Liu et al (2016) who proposed a PMM framework for evaluating the performance of PPPs that considers stakeholder orientation to design performance measures, which focus on satisfaction and expectation. In a similar vein, some authors suggest that performance measures should to be developed and aligned with the needs of both internal and external stakeholders (Moxham, 2014; Otheitis and Kunc, 2015).

7.2.2.6 Objective 4: Types of PMM framework used by construction firms

Findings from study show that a large number of Saint Lucian construction firms have developed their own internal PMM framework to assess their business performance. This finding concurs with the research results of Rompho and Boon-itt (2012) who found that a high proportion of firms from various industries deployed their own internal frameworks.

More specifically, the quantitative results suggest that Saint Lucian construction firms have developed their KPIs from both the construction industry and other perspectives. The survey finding is in line with finding of Meng and Minogue (2011). It is interesting to note that well-known CPMM frameworks like BSC were limitedly deployed within Saint Lucian construction firms. This finding is not surprising as the implementation and usage of the BSC has been relatively low in other developing countries (Khan et al., 2011; Upadhaya et al., 2014).

7.2.2.7 Objective 5: Barriers to & Strategies for CPMM implementation

A CPMM framework plays a vital role in improving organizational performance. The implementation of CPMM framework brings about significant change in organizations, which may give rise to several challenges and barriers in the process (Nudurupati et al. 2011; Jääskeläinen and Sillanpää, 2013). Therefore, in order to implement a CPMM framework successfully within firms, managers need identify, understand and then prioritize the barriers (Singh et al., 2016). Previous studies on the barriers to the implementation of CPMM frameworks in business organizations have categorised into internal and external barriers (Walker and Jones, 2012; Mourad, 2017). Accordingly, the study explores the internal and external barriers to the successful

implementation of CPMM framework within construction firms. Meanwhile, the research findings identified a wide range of internal organization barriers compared to a few external barriers. These CPMM framework implementation barriers are discussed below:

7.2.2.7.1 Internal barriers

The research findings identify eight major internal barriers for the successful implementation of a CPMM framework within Saint Lucian construction firms. They include higher implementation costs, inadequate resources for CPMM implementation, inappropriate organizational culture, lack of knowledge and understanding of the concept of PMM, lack of understanding of the expected benefits from CPMM framework, resistance to change, and staff complacency. The findings of this study strongly support and are consistent with the results reported in the extant literature.

For example, some researchers (Hwang et al., 2013; Metaxas and Koulouriotis, 2014) found that higher implementation costs hinder the successful implementation of a CPMM framework within business organizations.

Furthermore, the research results coincide with the findings of some researchers (Heras-Saizarbitoria, Casadesús and Marimón. 2011; Northcott and Taulapapa, 2012; Mosadeghrad, 2013; Gómez-López et al., 2017) who found that 'lack of resources' was important barriers that hamper firms from successfully implementing CPMM frameworks. Gómez-López et al. (2017) suggest resource barrier entail the lack of financial and physical resources and lack of tine.

It is not surprising that construction managers in Saint Lucia recognize inappropriate organizational culture as a significant implementation barrier because globally the construction industry is relatively slow to implement transformational organizational change and innovation to achieve continuous performance improvement. Moreover, the results illustrate that the existing culture of Saint Lucian construction firms does not fully encapsulate the right behaviour, values, and mind-set to implement a CPMM framework for performance evaluation. In addition, the qualitative research findings provide evidence to support conservative attitude, lack of a sense of urgency and poor attitude towards performance excellence as key attributes of inappropriate culture within Saint Lucian construction firms. In the same vein, Shang and Pheng (2014), found that inappropriate organizational culture as being among the most significant barriers to the

successful implementation of a CPMM framework within construction firms. Similar findings are reported in some other studies (Talib et al., 2011; Mosadeghrad, 2013; Talib and Rahman, 2015; Aamer, Al-Awlaqi and Alkibsi, 2017; Zhang et al., 2017).

Meanwhile, the findings from the quantitative component of the study found that higher implementation costs and inadequate resources for CPMM implementation were the most significant barriers to the implementation of a CPMM framework in construction firms in Saint Lucia. In contrast, the qualitative component of the study found that they were amongst the least significant barriers. This may imply that these barriers do not apply to context of the case study firms (Papakiriakopoulos and Pramatari, 2010; Maestrini et al., 2017).
Consistent with the results of this study, Ülgen and Forslund (2015) found that the lack of knowledge and understanding of the PMM concepts as a significant barrier to the successful implementation of a CPMM framework within firms. The literature highlights that sufficient understanding and knowledge on PMM concepts especially by management can help to increase the success rate in the implementation of CPMM frameworks.

According to the results from the study, lack of top management support was a moderately important internal barrier to the successful implementation of CPMM framework within construction firms. This is in contrast to the extant literature that observed lack of top management support as one of the most significant barriers in the successful implementation of a CPMM framework within business organizations (Talib et al., 2011; Shang and Pheng, 2014; Talib and Rahman, 2015; Singh et al., 2016; Attri, Singh and Mehra, 2017). Ostensibly, top management in Saint Lucian construction firms do not have sufficient knowledge and understanding of CPMM concepts. Accordingly, they did not accord high prominence to lack of management support as a critical barrier.

7.2.2.7.2 External barriers

Saint Lucian construction firms also identified external (environmental uncertainties) barriers that hinder the implementation of any CPMM framework within them. Economic downturn and uncertainty and political uncertainty have emerged from research findings as the two most significant external barriers to implementation of a CPMM framework in Saint Lucian

construction firms. The results may suggest that economic uncertainty and political uncertainty are the two main environmental uncertainties that influence and shape the management practices of firms in the construction industry in Saint Lucia. Similar to this study, Munir et al. (2013) observe that political uncertainty inhibits the implementation of CPMM frameworks within business organizations in developing economies.

7.2.2.7.3 Strategies to overcome barriers to CPMM framework implementation

The findings from the study reveal that Saint Lucia construction firms identified four main strategies to overcome barriers to the successful implementation of a CPMM framework within them. These strategies include education and training, leadership and top management commitment, a supportive culture for PMM, and gaining people's buy-in and involvement in a CPMM framework implementation process.

The research findings are consistent with the literature, which pointed out that one of the important strategies to overcome the barriers to the successful CPMM frameworks implementation within any organization is education and training (Mosadeghrad, 2014; Shang and Pheng, 2014; Azyan, Pulakanam and Pons, 2017). Talib et al. (2011) noted that training and education as well as committed leadership could promote change of employee attitude towards performance management and performance improvement culture that are necessary to implement a PMM framework within an organization. Moreover, education and training is very important because it allows the employees as well as managers to learn the basic concepts, and benefits of CPMM framework implementation (Mosadeghrad, 2014; Attri, Singh and Mehra, 2017). As suggested by Singh et al. (2016), training and education assist in changing the mind-set of both managers and employees from traditional PMM approach to the contemporary PMM approach.

In line with this study, many prior studies (e.g. Mosadeghrad, 2014; Willar, Trigunarsyah and Coffey, 2016; Belhadi et al., 2017; Schmidt et al. 2018) found that leadership and management commitment is among the most important strategies to overcome the barriers to the implementation a PMM framework within any firm. In the context of construction, Willar et al. (2015) found evidence that leadership and management commitment is the most important strategy to overcome the barriers to the adoption of a PMM framework such as the quality management systems within

construction firms. Putting leadership and top management commitment as a critical strategy is entirely justified, because leadership and management are responsibility to lead and manage the organization through the change (CPMM implementation) and innovation (Pirozzi and Ferulano, 2016). This involves directing and motivating participants involved in implementing change process (Pirozzi and Ferulano, 2016), changing the behaviour of others involved in implementing change (Azyan, Pulakanam and Pons, 2017), allocating adequate resources towards implementing change (Azyan et al., 2017), among others.

Willar, Trigunarsyah and Coffey (2016), in alignment with the research finding, found that an appropriate organizational culture is an important strategy for the successful implementation of CPMM framework in construction firms. Similar finding emerged from other studies (Goh et al., 2015; Sarhan et al, 2018). The findings of this study are justified, as an appropriate culture for PMM emphasises the importance of an organization having the right behaviour, values and climate for the successfully implementation of a CPMM framework with it. Willar et al. (2016) suggest that an appropriate organizational culture creates an organizational climate that supports performance improvement and change such as implementing a new system. Given that the construction industry in Saint Lucia lacks a PMM culture, it means that it would require cultural change (or paradigm shift) that is difficult to realise in the short term. Similarly, Goh et al., 2015, p.165) claim that moving toward a more PMM culture means changing mind-sets in the organization, one that would not change easily and quickly.

According to the findings of this research, construction firms that plan to implement a CPMM framework should gain buy-in of both managers and employee early in the implementation process to overcome potential implementation barriers. Other authors have also emphasise the importance of the buy-in of organizational members in overcoming the barriers to the successful implementation of CPMM framework. For example, Northcott and Taulapapa (2012) state that employee buy-in is a highly important strategy that that contribute to the successful implementation of CPMM framework. Similarly, some other authors (Singh and Sushil, 2013; Mosadeghrad 2014) found employees' involvement and commitment is a necessary strategy for the implementation of a CPMM framework.

The findings further illustrate that an appropriate implementation plan, an appropriate ICT infrastructure, clear organizational strategy and goals, increase accountability throughout the organization were the insignificant strategies to overcome barriers to the CPMM framework implementation success. The findings also contradict the observations of previous studies such as (Searcy, 2011), which emphasised the importance of an appropriate implementation plan for the successful CPMM framework implementation. Furthermore, the research is not aligned with that of Nudurupati et al. (2011) who stated that business organization need to establish a reliable information system infrastructure for successful implementation of CPMM framework (Nudurupati et al., 2011).

7.2.2.7.4 Factor analysis for the barriers to CPMM framework implementation.

Using factor analysis, the barriers to the implementation of a CPMM framework in the Saint Lucian construction industry have been classified into three principal components (factors), namely commitment and culture barrier, organizational background and resources, and external barrier. These results of the PCA show that only the external barrier title was retained theoretical framework, whilst the internal barrier title was split into two titles. These barriers are discussed below.

Commitment and cultural barrier is heavily loaded with six variables that demonstrate the limited involvement of managers and employees and inappropriate culture for the implementation of a CPMM framework in the Saint Lucian construction industry. The variables include lack of top management support, lack of employees' involvement, lack the understanding of the concepts and benefits of PMM framework and lack of a supportive organizational culture. This finding is largely consistent with the findings of some authors in both developed and developing countries (e.g. Corbett and Angell, 2011; Khan et al., 2011; Tung et al., 2011; Gómez-López et al., 2017; Zhang, Narkhede, and Chaple, 2017). For example, this finding coincides with those found of Gómez-López et al. (2017) who, in using factor analysis, found that behavioural and cultural barriers was the main barrier (principal component) to the implementation of CPMM framework within Spanish firms. In a similar vein, this research findings is consistent with those of Shang and Pheng (2014) who, in using a factor analysis, found that lack of 'support and commitment' and cultural

and philosophical' as two significant barriers to the implementation of a CPMM framework in the Chinese construction industry.

Organizational background and resources barrier is deeply loaded with six variables representing the constraint of firm size and organizational resources to the successfully implementation of a CPMM framework within Saint Lucian construction firms. The extant literature focuses much more on organizational resources barrier rather than on organizational background and resources barrier. This finding is generally in line with the findings of some authors (e.g. Corbett and Angell, 2011; Khan et al., 2011; Gómez-López et al., 2017; Zhang et al., 2017).

External barrier is loaded with four variables representing the political uncertainty, social uncertainty, economic uncertainty and technological reluctance and uncertainty. This finding consistent with literature (e.g.Munir et al., 2012; Otley, 2016).

7.2.2.8 The need for a CPM framework in the Saint Lucian construction industry

The findings of the study suggest that the need for a CPMM framework in the Saint Lucian construction industry to evaluate project and organizational performance. Some studies have recognized the need to develop a conceptual framework to evaluate the performance of construction firms. For example, the study Jin et al. (2013) proposed a modified BSC based framework for evaluating the performance of construction firms. In the study of Oyewobi et al. (2015), an integrated construction excellence model was proposed to assist construction firms to assess their performance. More recently, Willar (2017) proposed a performance assessment system for the evaluation of construction firms' performance. Meanwhile, performance excellence model is another PMM framework proposed that could be used for evaluation and improvement in the performance of construction firms.

Moreover, the qualitative research findings suggest that the CPMM framework into account the needs of influential stakeholders of the firm as articulated by some authors (e.g. Schiffling and Piecyk, 2014; Liu et al., 2016; Dimitropoulos, Kosmas and Douvis, 2017). Very importantly, the CPMM framework should be utilised by construction firms to generate value for firms and

stakeholders to facilitate their levels of effectiveness and efficiency (Kärnä and Junnonen, 2016). Furthermore, it should be simple and easy to implement and use within construction firms.

7.2.2.9 Recommendations for improvement of the PMM practices with construction firms

The research findings identified some key ways that Saint Lucian construction firms can deploy to improve their PMM practices.

- Top construction managers should make CPMM a strategic priority.
- Promoting a performance management culture;
- Greater integration of their existing PMM framework with other management systems or sub-systems using appropriate ICT;
- Conversion of existing PMM framework to a CPMM framework, which would be used to better evaluate their performance. It is not only necessary to introduce some new suitable performance measures that are align strategic priorities but also to utilise appropriate ICT to support the updated or modified framework. However, on evidence was provided regarding a review of existing performance measures. Furthermore, evidence suggest that case firms should adopt an incremental approach for facilitating improvements in the existing PMM framework.

Chapter 8 Development and validation of conceptual framework

8.1 Introduction

This chapter presents the development and validation of the conceptual framework of this study. The development (and subsequent use) of a reliable and valid PMM framework for evaluating Saint Lucian construction firms is necessary for the achievement of their short term and long-term objectives.

8.2 Development of the conceptual framework

The conceptual framework was initial developed from the literature review and evolved as the study progresses. The extensive literature review enhances the content validity of the key variables identified for inclusion in the conceptual framework. The proposed framework was based on the BSC conceptual framework. The BSC is used because it has been, to some extent successfully, tested over time and is one of the most widely adopted generic CPMM framework in theory and practice (Antonsen, 2014; Altin et al., 2018) and in particular in construction (Oyewobi et al., 2015). Compared to other CPMM frameworks, BSC could link performance among different performance dimensions or perspectives in a firm (Valmohammadi and Servati, 2011). Furthermore, the BSC could help business organizations to capture and integrate the interests of their key stakeholders. Accordingly, the proposed conceptual framework considers the needs of shareholders as well as other relevant stakeholders in the construction industry such as customers, suppliers, and the environment/community, which were often ignored in most previous CPMM frameworks (Chan, 2009). Moreover, the proposed conceptual framework supports strategy development and implementation at all level within an organization. Figure 8.1 shows the proposed conceptual framework for PMM from the literature review and the empirical findings of the study.

The development process adopted in this study involves providing a definition of conceptual framework, establishing the need for a conceptual framework in construction, development of performance measures, and description of its components, which are now discussed below.

8.2.1 Definition of conceptual framework

Shanmugapriya and Subramanian (2016) define a conceptual framework as "a process comprising of concepts and causal relationship between these concepts" (p.1139). Miles, Huberman and Sadana (2014) provided a boarder definition for conceptual framework as follows.

> A conceptual framework explains, either graphically or in narrative form, the main things to be studied – the key factors, constructs, or variables – and the presumed relationships among them. Frameworks can be rudimentary, or elaborate, theory driven or commonsensical, descriptive or casual (p.20).

Similarly, Moore et al. (2009) assert that a conceptual framework represents a collection of variables and events that might interact among each other to produce desired results or outcomes, and it is usually robust when it is based on research. Therefore, it is a visual display of the important variables or conceptus of the study and the interplay between them. A conceptual framework can determine the information that should be collected and analyzed for the study.

Kumar (2014) distinguishes between conceptual framework and theoretical framework. The conceptual framework describes the key variables that are chosen from the theoretical framework to form the basis of the study, while the theoretical framework comprise the theories or issues, which are embedded in the study (Kumar, 2014). The aim of a conceptual framework is to provide a logical sequence in addressing the different aspects of the research problem (Kumar, 2014) and thereby to attain the research aim and objectives. In this study, the proposed CPMM conceptual framework encapsulates the key components (or concepts) of PMM, and attempts to demonstrate the interaction between them to produce the desired outcomes for the study.

8.2.2 The need for a CPMM conceptual framework in construction

Many previous PMM studies (e.g. Yu et al. (2007; Luu et al., 2008, Horta et al., 2010; Jin et al., 2013; Ercan and Koksal, 2016) have highlight the importance of establishing a CPMM framework comprising both financial and non-financial performance measures to evaluate the performance of projects, firms and the construction industry on the whole. Jin et al. (2013) suggest that more research is needed to understand how a conceptual framework can be implemented, used, and updated successfully within a changing construction business environment. Furthermore, the

conceptual framework should not only reflect the unique characteristics of the construction industry but it should capture its dynamic nature (Jin et al., 2013; Liu et al., 2015).

It has been recognized that a conceptual BSC framework will provide a systematic and structured way for construction firms to better measure, evaluate and manage their performance, and assess the contribution of key stakeholders. Ali et al. (2013) suggest that a conceptual framework provides a conceptual understanding of the key aspects and practical issues involved in PMM practice of construction firms. The conceptual framework can provide practical value to construction firms that are striving to compete in both domestic and the international construction markets (Jin et al., 2013). Moreover, it could provide a holistic perspective to measure and evaluate the performance and competitiveness of construction firms (Ercan and Koksal, 2016). Consistent with prior studies (Ali et al., 2013; Ercan and Koksal, 2016), the conceptual framework can facilitate benchmarking of performance within each construction firm, and among firms in the construction industry. Furthermore, it has the potential to be tailored to the specific needs and texts of construction firms. Deng and Smyth (2014) suggest that construction practitioners should trade-off between the practicality and comprehensiveness of a conceptual framework.

8.2.3 Development of performance measures

Construction firms should ensure that every key component of their PMM framework should be derived or translated from their strategy (Niven, 2014). Many authors (e.g. Soderberg et al., 2011; Dekker et al., 2013; Baird, 2017) support this view. They need first to formulate their strategy and then establish the linkage between strategy formulation processes and PMM framework as articulates by some authors (Gimbert et al., 2010; Micheli and Mura, 2017). Gimbert et al. (2010, p.479) define strategy formulation as "the process through which a firm defines its overall long-term direction and scope" to create value. Luu et al. (2008) suggest strategy can be developed and modified from SWOT analysis. Some study (Luu et al., 2008; Latiffi et al., 2010) found that performance measures were derived directly from corporate strategy formulation using a strategic map. These strategy-driven performance measures should comprise a diverse set of both financial and non-financial performance measures covering relevant perspectives of the construction firm (Deng and Smyth, 2014).

8.2.4 Identification of the key components of the conceptual framework

The initial proposed conceptual BSC framework from the literature and the empirical evidence from the study comprises the following key components: BSC perspectives, critical success factors (performance criteria), and corresponding performance measures that are relevant the construction industry, which is exhibited in Table 8.1 below. The key components of the proposed conceptual framework are explained in the following set-sections.

Step 1: identification of perspectives

It is imperative for construction firms to identify their performance perspectives that represent a comprehensive coverage of all pertinent aspects of their business model. Some authors have proposed the use of the original perspectives of BSC to assess the performance of construction firms (Yu et al., 2007). However, Lueg (2015) suggests that the original BSC ignores developments in the industry-specific, social and natural environments (p.37). Accordingly, some other authors have added relevant perspectives to the original perspectives of the BSC to evaluate the performance of construction firms (e.g. Jin et al., 2013) or have replaced existing perspectives of the original BSC with new ones (e.g. Ozorhon et al., 2011). The conceptual BSC framework proposed in this research includes three additional performance perspectives to the four original perspectives of the BSC namely project perspective (Kagioglou et al. 2001); supplier perspective (Kagioglou et al. 2001); and environment & community perspective (Parmenter, 2015; Björklund and Forslund, 2013) to reflect the distinct characteristics of the construction industry. The proposed conceptual framework therefore attempts to include the triple bottom line aspects of sustainability, namely economic, social and environmental performance (Yadav-Sushil and Sagar, 2013). The seven potential interrelated performance perspectives are now briefly discussed.

(1) Financial perspective: The financial perspective focuses on providing value to the shareholders of construction organizations in terms of improvements in the bottom line results (Chan, 2009). Construction organizations can use this perspective to demonstrate their financial accountability and stewardship through the production and validation of financial statements.

(2) Customer perspective: PMM in construction is usually customer/client-driven. Therefore, the customer perspective is critical for construction organizations to assess their customers'

requirements (Oyewobi et al., 2015). Furthermore, construction firms should maintain close customer relationships and achieving high quality in their operations to create value to the customers (Jin et al., 2013).

(3) Internal business processes: This perspective requires construction organizations to place emphasis on improving the internal efficiency of their business processes to achieve excellence (Ali et al., 2013; Jin et al., 2013). Furthermore, construction firms should also place emphasize on the integration of their functions and processes.

(4) Learning and Growth: This perspective requires construction organizations to invest in their human resources development, their competency, and informatization (Yu et al., 2007), in order to manage their business and improve their performance and ability to adapt to change (Perkins et al., 2014). This perspective allows construction firms to achieve improvements in the performance in the other perspectives.

(**5) Project perspective:** The construction industry is mainly project based (Ozorhon et al., 2011; Keung and Shen, 2013). Therefore, this perspective requires construction organizations to drive focus on evaluating the successfully achievement of project performance. Project performance is the realization of predefined project objectives (Ozorhon et al., 2011) and hence project success.

(6) Supplier perspective: The supplier perspective requires construction firms to evaluate and monitor suppliers' performance in term of service quality and speed of service delivery, flexibility, and the relationships and partnerships with them. It has been acknowledged that effective management of suppliers within the complex construction supply chain can contribute towards the achievement of performance outcomes, and ultimately enhance suppliers' performance. As part of supplier performance evaluation, several authors have recognized the importance of managing supplier-buyer or supplier relationships to drive organizational performance (e.g. Bemelmans et al., 2012; Forkmann, Henneberg, Naudé and Mitrega, 2016; Maestrini et al., 2018; Hudnurkar et al., 2018). Based on the forgoing, construction firms should evaluate their suppliers' performance and as such, this study considers this perspective in the proposed conceptual PMM framework.

(7) Environment & Community perspective: As previously mentioned, there are growing demands for the incorporation of an environmental and community perspective and/or performance measures within CPMM frameworks of business organizations (Björklund and Forslund, 2013). However, it is recognized that construction organizations have not given prominence to this perspective in their PMM frameworks. Consequently, this study considers this perspective in the proposed conceptual PM framework.

Step 2: identification of CSFs and performance measures

Some construction researchers (Kulatunga et al., 2011; Cheng et al., 2014) have underscored the importance of identifying organizational CSFs that are aligned with each perspective within the CPMM framework. CSFs are a number of important factors on which organizations should direct and concentrate their limited resources in order to achieve success (Yong and Mustaffa, 2013). Construction organizations also need to identify an appropriate set of performance measures and associated targets for each of the identified CSFs (Toor and Ogunlana, 2010; Parmenter, 2015) to monitor the achievement of their mission, strategy, goals and objectives. Moreover, the proposed conceptual framework uses both financial and non-financial measures of performance to reflect the holistic coverage of an organization's business model.

Step 3: definition of a framework review procedure

A PMM framework should also include a procedure for it review or assessment (Taticchi et al., 2012). The review process should be conducted to ensure that its relevance to organizational strategy and the business environment, for continuous improvement and for questioning strategic assumptions and actions, and hence to improve its effectiveness (Gutierrez et al., 2015). Moreover, the results of the review process could be used to refine the key components of, or the entire PMM framework to meet key stakeholders' expectations (Gutierrez et al., 2015).

Step 4: diagrammatical representation of the conceptual framework

Figure 8.1 exhibits the initial conceptual PMM framework based on the literature for evaluating the performance of construction firms. This initial proposed conceptual framework, called the Holistic Business Scorecard (HBS), focuses on specifying the key components required for evaluating the performance of construction firms, which are also link to strategy formulation. It

includes a component to perform review procedures that will ensure its relevance to strategy and the changing business environment as suggested by Gutierrez et al. (2015).

Holistic Business Scorecard (HBS)

Strategy formulation:
Organizational vision & mission; goals and objectives; strategies & policies

#	Perspective	Critical success factor	Performance measure
1	Financial	Profitability	Profit margin; Return on investment.
		Liquidity	Current ratio, cash flow level, receivables level.
		Growth	Sale revenue growth rate; Net profit growth.
		Financial stability	Debt level; debt ratio; interest coverage.
2	Customer	Client or customer satisfaction	Customer satisfaction ratings, number of customer complaints.
		Customer acquisition	Number of new customers/clients; customer/client growth; number of improvement suggestions.
		Return on customer relationships	Percentage of repeat customers, relative market share; organization image
3	Internal business processes	Quality	Response time; level of defect.
		Process management	Process time, % of expenses to total revenue, tender success rate; construction productive rate
		Safety	Accident level/rate; time loss to accidents; Incident cost; safety and health audit.
		Risk management	# Of risk management meetings, risk management responses, risk assessment review, risk scores for core construction business activities.
4	Learning and growth	Employees/employee development	Employee satisfaction survey; % of employees with degrees; Training hours per employee per year; Employee productivity; employee absenteeism; recognizing & rewarding employee outstanding performance; # of employee improvement suggestions.
		Organizational competency	Competency coverage ratio, Investment in leadership, Investment in knowledge management efforts.
		Technology competency	Level of IT/ICT application in construction; Investment in IT for construction; % of employees using computers in construction.
5	Supplier	Supplier management	Level of supplier's defect–free deliveries; % of supplier on-time delivery, supplier lead time against industry norm, level of supplier satisfaction; level of flexibility; # of innovative suggestions from suggestions.
6	Project	Project management	Time of delivery, actual costs vs budgets costs quality of workmanship and product, project profit margin; client satisfaction; level of project safety.
7	Environment & community	Sustainability	Level of environment compliance; Energy consumption; water consumption, waste and scrap level, contribution to the community

Ongoing& periodic Review; Data/information and analysis

Figure 8.1 Proposed initial conception framework

As mentioned earlier, the proposed initial conceptual framework was developed through extensive literature review. The literature review evaluated the key variables, themes or elements to build the initial conceptual framework. Following the philosophical stance of pragmatism, the study a mixed methods research, applying both quantitative (questionnaire survey) and qualitative (two case studies) enquiries. Moreover, the case study design or strategy considers semi-structured interviews and documentary analysis. These different research design or strategies and data collection methods provided methodical and data triangulation to ensure the reliability and validity of the data collected and hence the framework.

The questionnaire survey and case findings were used to refine the initial conceptual framework for PMM. Table 8.2 depicts the refined proposed framework as the proposed framework to evaluate the performance of construction firms. The refined proposed framework was later validated. The next sections discuss the validation of the proposed framework.

Holistic Business Scorecard (HBS)

Strategy formulation:
Organizational vision & mission; goals and objectives; strategies & policies

#	Perspective	Critical success factors	Performance measures
1	Financial	Profitability; Liquidity; Growth; Stability.	Profit/profit margin; Return on investment; Cash flow level; Level of receivables; Level of debt; Revenue growth rate.
2	Customer	Client or customer satisfaction; Return on customer relationships; Customer acquisition.	Customer satisfaction ratings; Percentage of repeat business customers; Organization (corporate) image; Client/customer growth; Number of new clients or customers.
3	Internal business processes	Quality of service/product; Process management; Risk management; Information & equipment technology utilisation	Response time to business issues; Processing time; Construction productivity rate; Level of defeats or errors; Percentage of expenses to total sales revenue; Successful tenders' rate; Number of meetings; Risk management responses; Risk or safety levels.
4	Learning and growth	Employee development; Information technology (IT) competency; Organizational competency Leadership	Percentage of employees with computers; Employee satisfaction rating; Recognizing & rewarding employee; Employee productivity rate; Level of IT application in construction; Investment in IT for construction. Competency coverage ratio; Leadership competency level
5	Supplier	Supplier management	Level of supplier's defect-free deliveries; Percentage of on-time supplier deliveries; Level of supplier satisfaction; Level of flexibility; Supplier lead-time against industry norms.
6	Project	Project management	Quality of workmanship and final product; Actual cost Vs budgeted costs; Client's satisfaction; Time of delivery against agreed standards; Project productivity rate; Level of project safety; Project profit margin.
7	Environment & community	Sustainability	Level of environmental compliance; Energy consumption; Water consumption; Number of jobs created; Contribution to the local community; Waste and scrap level.

Review - ongoing & periodic
Data/information and analysis

Figure 8.2 Refined proposed conception framework

8.3 Validation of the proposed conceptual framework

This section presents the validation approach for the conceptual framework developed from the findings of the literature review, questionnaire survey and case studies. The study undertakes the validation of the resulting refined framework (see figure 8.2) through interviews (see appendix H) with experts in the Saint Lucian construction industry.

8.3.1 Validation process

Some authors (Mishra et al., 2018; Sangwa and Sangwan, 2018) assert that a proposed framework that is conceptualised need to be validated by doing empirical study such as survey or case study before being populated in any particular industry. Therefore, the validation of this proposed framework would ensure its applicability in the Saint Lucian construction industry. Moreover, the validation process would allow for the revision and further refinement of the proposed framework, leading to a final and validated framework.

This study adopts the following essential steps to validate the conceptual framework: (1) identification of the validation aim and objectives, (2) respondent demographics, (3) research methods adopted, (4) presentation of the analysis, findings and discussion of the validation and (6) final version of the framework.

8.3.2 Validation aim and objectives

The aim of the framework validation is to confirm by experts in the construction industry the acceptance of the proposed CPMM framework for better measuring and managing the performance of Saint Lucian construction firms in relation to its clarity, comprehensiveness, applicability and practicality.

To achieve the aim of the validation of the proposed CPMM framework, the following specific objectives were set for achievement:

- To identify participants' perceptions and opinions on the clarity, comprehensiveness, applicability and practicality of proposed framework and its elements;

- To identify possible ways of improving the proposed CPMM framework in relation to its clarity, comprehensiveness, applicability and practicality.

8.3.3 Respondents demographics

Table 8.2 illustrates the profile of the interviewees who participated in the validation exercise. As can be seen from Table 8.2 below, all interviewees had over twenty (20) experience and expertise in the construction industry, belonged to the upper management echelon within their firms, and possessed at least Bachelor's Degree. Consequently, they were deemed to have sufficient knowledge and understanding of PMM and the issues of the Saint Lucian construction industry. This enhances the validity and reliability of the validation findings.

Table 8.1 Profile of respondents

Interviewee	Position	Qualification	Professional background	Experience in construction industry
RV 1	Managing Director	FRICS	Construction & quantity surveying	40 years
RV 2	Project Manager	BSc, PMP	Construction & quantity surveying	30 years
RV 3	Managing Director	BSc	Engineering, construction & performance management	32 years
RV 4	Managing Director	BSc	Engineering, construction & performance management	25 years
RV5	Managing Director	BSc	Engineering , construction & performance management	35 years
RV6	Managing Director	MSc, BSc	Construction and Performance Management	35 years
RV7	Managing Director	MSc, BSc	Construction and Performance Management	22 years

8.3.4 Research methods adopted for the validation

For the validation of the framework, the study adopts structured and semi-structured interviews with construction industry experts in Saint Lucia. In the same vein, this study adopts the interview method for the validation because it is widely conducted for data collection to validate generated conceptual frameworks of research (Cooper and Schindler, 2014). Cooper and Schindler (2014) refer to interviews with respondents that are knowledgeable about a particular problem or phenomenon as expert interviews. For expert interviews, researchers can use either one or a

combination of the three of interviews, namely semi-structured or unstructured interviews (Cooper and Schindler, 2014), or structured interviews.

The literature (e.g. Alsulamy, 2015) asserts that the validation of a proposed BSC framework is considered successful when there is a consensus about acceptance of the framework among respondents (e.g. experts). Some previous studies (e.g. Luu et al., 2008) suggest that a study must obtain at least 50% of consensus for the successful validation of a proposed framework. Like these prior studies, a consensus of 50% among experts is considered acceptable for the validation in this study.

The expert interviewees were provided in advance of the interviews with three important documents: The interview schedule (see appendix H), refined conceptual framework of the study (see figure 8.2) and definitions of key terms used in the framework (see appendix J). The experts were required to review the documents before undertaking interviews in order to prepare for the interview.

The interview consists of the following four main sections: Section 1 covers the background information; Section 2 covers the proposed CPMM framework; Section 3 covers elements of the proposed CPMM framework and Section 4, general comments on the proposed CPMM framework. Section 2 of the interview schedule compromise the structured interview questions, whereas section 3 and 4 consist of the semi-structured interview questions.

The actual number of interviews was determined by the achievement of saturation point. A purposive sample of only five (5) interviews with construction industry experts for the validation exercise were originally considered. However, saturation point was reached after the seventh interviews for validation of the CPMM framework in this study.

For the structured interviews, the seven industry experts were asked to indicate their opinion about the level of agreement or disagreement on proposed framework's applicability in terms of the clarity, comprehensiveness, usefulness and practicality. The assessment was made using a five-point Likert type scale system (where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree,

and 5 = strongly agree). The quantitative data collected were analyzed using SSPS version 23 and Microsoft Excel.

Immediately after conducting the structured interviewed, the semi-structured interviews were conducted with the same seven construction industry experts. The interviews lasted between 40 minutes and one hour. All the semi-structured interviews were audio-recorded and then transcribed for analysis. Notes were also taken during interviews. All the experts were from different Saint Lucian construction firms. The interviews were administered face to face with the interviewees. The qualitative data collected were analyzed manually using thematic analysis. Moreover, the qualitative data analysis uses the frequency of mentions by respondents to determine the importance of the themes emanating from the qualitative data. Furthermore, direct quotes from the transcripts were used where necessary to explore the key themes that emerged from the qualitative data.

8.3.5 Analysis, findings and discussion of validation

8.3.5.1 Analysis and discussion of the quantitative findings

8.3.5.1.1 Reliability

Using SSPS version 23, the internal consistency reliability among the 16 items or variables of the structured interview instrument was assessed using Cronbach's alpha coefficient. The overall Cronbach's alpha coefficient for the 16 items in the structured interview instrument was found to 0.626. This is below the threshold value of 0.7, but it is above the value of 6.00 recommended for exploratory research such as this study. Furthermore, if the item known as 'framework contains both internal and external measures' is deleted, then the overall Cronbach's alpha coefficient for the balance of the 15 items in the instrument would increase to 0.726. Thus, the structured interview instrument with the 15 items was deemed to achieve sufficient internal consistency and reliability.

8.3.5.1.2 Mean ranking analysis

Descriptive statistics was used to analysis the data gathered from the structured interview survey. Table 8.1 shows that the results of the structured interview survey for the validation. It provides the mean score, standard deviation and ranking of each variable within the acceptability criteria. Based on the structured interview results, all the variables within the acceptability criteria received a high score from the industry experts as shown by the mean scores of over 4 points. Overall, the mean score of all the variables used in the structured interview is 4.69. Furthermore, applicability of the proposed PMM framework criterion received the highest mean score of 4.79, whereas comprehensiveness of proposed PMM framework criteria received the lowest mean score of 4.486.

Furthermore, the item known as 'The proposed PMM framework is comprehensive for measuring the performance and aligning strategy of a construction firm' within the comprehensiveness of proposed PMM framework criterion as the lowest (mean 4.14). Overall, these results demonstrate consensus among the industry experts that the CPMM conceptual framework is highly applicable and valid for measuring and managing the performance of Saint Lucian construction firms.

Table 8.2 Acceptability of the PMM framework by St. Lucian construction firms

	Acceptability criterion	**Mean**	**STD**	**Ranking**
1	**Clarify of proposed PMM framework**			
1.1	The proposed PMM framework has a clear structure.	4.86	0.378	1
1.2	The proposed PMM framework contains clearly defined critical success factors (CSFs) and performance measures.	4.71	0.488	3
1.3	The PMM framework is clearly link to strategy formulation or development.	4.86	0.378	1
1.4	Words and terms used in the PMM framework are understandable.	4.71	0.488	3
1.5	The PMM framework is relatively easy to understand and use.	4.57	0.535	5
	Overall criteria	**4.743**		
2	**Comprehensiveness of proposed PMM framework**	**Mean**	**STD**	**Ranking**
2.1	The proposed PMM framework is comprehensive for measuring the performance and aligning with strategy of a construction firm.	4.14	0.690	5
2.2	The framework would provide information necessary to evaluate the performance of a construction firm.	4.29	0.756	4
2.3	The framework contains sufficient important elements (perspectives, CSFs & measures) to capture comprehensively the performance a construction firm.	4.86	0.378	1
2.4	The proposed PMM framework contains both financial and non-financial performance measures	4.71	0.756	2
2.5	The PMM framework would reflect the needs of both internal and external stakeholders of a construction firm.	4.43	0.535	3

	Overall criteria	**4.486**		
3	**Usefulness of proposed PMM framework**	**Mean**	**STD**	**Ranking**
3.1	A construction firm could use PMM framework to provide a holistic (comprehensive) view of its performance.	4.71	0.488	3
3.2	A construction firm would realize benefits from using the PMM framework.	4.71	0.756	3
3.3	The PMM framework can be used in the strategy management process of a construction firm.	4.57	0.535	5
3.4	The PMM framework can be used to improve the performance of a construction firm.	4.86	0.378	1
3.5	The PMM framework provides a review mechanism to assess its relevant to changes in strategies and the business environment of a construction firm.	4.86	0.378	1
	Overall criteria	4.75		
4	**Applicability of the proposed PMM framework**	**Mean**	**STD**	**Ranking**
4.1	The proposed PMM framework could be practically applied within a construction firm.	4.86	0.378	1
4.2	The proposed PMM framework would be practically applied in the construction industry.	4.71	0.488	2
4.3	**Overall criterion**	**8.786**		
	Overall instrument	**4.688**		

8.3.5.2 Analysis and discussion of the qualitative findings of the validation

In this section, the main findings are presented according to the questions of the semi-structured interviews in of the validation interview question schedule as follows.

8.3.5.2.1 Elements of the proposed CPMM framework

Most of the experts suggest that the seven (7) performance perspectives, associated CSFs and performance measures are relevant and adequate to evaluate the performance of Saint Lucian construction firms. Some of the interviewees suggest that since the framework is linked to strategy development, organizational members (managers and employees) would tailor their actions in line with the successful achievement of strategic objectives of their construction firms. This finding supports those in the study of Pedersen and Sudzina (2012), who claim that a PMM framework promoting and supporting the right behaviour of employees will enable a firm to achieve its business objectives.

On the other hand, some of the experts mentioned that computer literacy and fulfilment of contracts should be added to the framework as a performance measures. The majority of the interviewees perceive that measuring the rate of computer and information technology literacy among

construction firms will give them an indication of the level of application of basic computer and technology skills possess by workers to perform their daily tasks. This could lead to improvement on operational efficiency. Furthermore, some interviewees mentioned Microsoft project, excel and words are important computer skills that construction workers should possess in today's business environment.

The findings of the semi-structured interviews show that the proposed BSC conceptual framework was considered acceptable for better measuring and managing the performance of firms in the Saint Lucian construction industry. For example, RV4 asserted, "*This PMM framework can be put into practice within construction companies to improve their performance. It has adequate performance measures that can be used by any construction company depending on their needs and circumstances". Furthermore,* RV 2 noted, *"I think that this PMM framework is useful for assessing the performance of companies in the construction industry".* These above quotes support the acceptability and adaptability of the CPMM framework in the Saint Lucian construction industry.

8.3.5.2.2 Ways of improving the proposed CPMM framework

The construction industry experts were asked to articulate their perceptions of the ways in which to improve the proposed BSC framework to be used for better evaluation of the performance of Saint Lucian construction firms. Most of the respondents suggest that the importance of using ICT to facilitate data collection and analysis, and information dissemination. Evidence from the interview results indicate that increasing the computer literacy within construction firms could improve the proposed framework. The respondents further stated that there is a need to increase computer literacy at all levels within the Saint Lucian construction industry and the level of computer literacy should be considered as performance measure.

Moreover, they suggested that the proposed BSC framework should be supported by tools such as prototype application for PMM, web-enabled or online, mobile computing technologies and development guides in order to improve its practical application in the Saint Lucian construction industry.

Most of the respondents also asserted that performance targets should be added to the BSC framework for its improvement. This viewpoint is highlighted in the following quote, "*Well without performance targets, a construction firms will be like an ocean without boundaries. Therefore, I would recommend the inclusion of targets in the proposed PMM system"* (RV4). In addition, most of respondents suggested that the proposed BSC framework should be first pilot in a few Saint Lucian construction firms, and the lessons learnt from these pilot studies would be used to improve the proposed conceptual BSC framework. Some interviewees suggest that construction firms can adopt a phased approach for the implementation of the proposed framework and the learning learn from the successful implementation of the first can be used to improve the next phase of PMM framework implementation and so on.

The need to assess or audit the level of PMM practice within the Saint Lucian construction industry was highlighted by the most of the respondents. Some of the same respondents further suggest that the assessment should be commissioned by Government of Saint Lucia. The outcome of the assessment could be used for further refinement and improvement of the proposed BSC framework. This interesting finding is consistent with those obtained by other authors (e.g. Bititci et al., 2015), who found that a firm or an industry can deploy a maturity model to assess its level of PMM practice.

On the other hand, the respondents suggest some challenges of using the BSC framework in the Saint Lucian construction industry. The challenges include the lack of management support and lack of human resources within construction firms in Saint Lucia to implement the proposed BSC framework. According to RV 6, "*Generally, construction managers and executives in Saint Lucia demonstrate a lack of sense of urgency for change to a modern framework for performance management. So, I believe management commitment might not be forthcoming".* To address these challenges, most of the interviewed experts suggested that the introduction of an education and training programme can help Saint Lucian construction firms develop appropriate staff to enable them to implement and use the proposed BSC framework. RV3 suggest, *"I believe that the construction firms in Saint Lucia do not possess managers who are sufficiently competent in all key aspects of performance management and as a result training in this area would be a must".*

There was a general acknowledgement by the interviewees that training would increase the knowledge and understanding of PMM within the Saint Lucian construction industry.

8.3.5.2.3 Potential benefits of proposed CPMM framework

Based on the interview results, the potential benefits of the proposed CPMM framework identified are as follows:

- It will provide performance information on key aspects of the project and organizational performance.
- It will provide sufficient management information to improve the quality of decision making and performance;
- It can be used to assess the efficiency of resource utilization within the construction firms;
- It components are related to strategy development; which can enable firms to achieve their objectives;
- It can help to improve the performance management capabilities of construction firms in Saint Lucia as well as increase learning within them. Some authors (Briggs et al., 2010; Forslund, 2012) suggest that performance management capabilities are of special importance for competitiveness of firms;
- It can help firms to demonstrate accountability for performance;
- The performance targets enable the PMM framework to be linked to individual and team accountabilities; and
- It can contribute to an overall improvement in PMM practice throughout the Saint Lucian construction industry.

8.3.5.2.4 Limitations of the proposed CPMM framework

Although the interviewees highlighted the usefulness of the application of the proposed framework in the construction firms, they also mentioned some limitations of the proposed framework. The majority of respondents suggested that a key limitation was the requirement of large amount of time, sustained efforts and resources to implement the framework within a construction firms in Saint Lucia. Furthermore, some respondents suggested that a large number of construction firms in Saint Lucia fall within SMEs and may not have the required resources for the implementation of this proposed BSC framework. For example, RV2 stated, "*I believe it will cost some money to*

implement this PMM framework within construction firms, especially in small and medium size ones".

Another limitation reported by most interviewees was the lack of performance management capabilities within construction firms to support the adoption and use of the framework. Dekker, Ding and Groot (2016) suggest that firms would determine their strategies and objectives based on the risks that they face and on their performance management capabilities. This implies that if performance management capabilities were low in firms, then implementation of such a framework would not be of strategic importance to them. RV6 suggested, "*In Saint Lucia, I have seen a trend in construction firms where they hire non-construction professionals to improve their general management rather than their performance management. In addition, the industry still lacks a structured framework to do so".*

Uncertainty regarding the achievement of a reasonable return on investment in a CPMM framework was also highlighted as another limitation in the adoption and use of the proposed framework. This is consistent with the findings in the literature.

One respondent suggested that the proposed BSC framework is not designed to provide hierarchical levels of performance measurement and management for construction firms. Another respondent suggested that the size of the firm could be a limitation to the adoption and use this framework

8.3.5.2.5 Experts' perceptions of the PMM practice within Saint Lucian construction industry

Some respondents believed that focus of construction firms is on practicing performance measurement rather than performance measurement and management. One of the respondent (RV5) commented,

> Well, we have been measuring performance of projects and firms in the industry from time immemorial. However, the practice of PMM seen to be non-existent in the Saint Lucian construction industry. But I think this proposed framework will be the starting point for PMM in the industry in Saint Lucia (RV5).

Some of the experts were of the view that Saint Lucian construction firms do not like to share performance information and practices and therefore this approach will hinder performance benchmarking among firms in the industry.

Three out of seven interviewees mentioned that, there was a general lack of accountability within the construction industry in Saint Lucia that negatively affects the practice of PMM and the image of the industry. They strongly recommend a culture of self – accountability and high performance. RV7 remarked, "*I think one of the key issues with PMM practice in the construction industry is to get line managers and employees to be more productive and accountable to produce better results".*

A few respondents suggested that the PMM practice in the industry tends to focus on the achievement of an organization's performance targets whilst ignoring behavioural factors and the alignment of organizational and individual objectives. They recommend a PMM approach that takes these factors in to consideration.

Final version of the framework

The results of the validation were used to refine the proposed framework. Most specifically, opinions and suggestions from industry experts were incorporated in the proposed framework. Figure 8.3 represents the final version of the conceptual BSC framework.

The PMM conceptual framework comprises of following elements that linked to strategy development:

- Seven performance perspectives namely financial, customer, internal business process, learning and growth, supplier, project and environment and community perspectives;
- Seventeen critical success factors (performance criteria);
- Forty six (46) performance measures

Construction firms can use elements based on their circumstances.

Holistic Business Scorecard (HBS)

Strategy formulation:
Organizational vision & mission; goals and objectives; strategies & policies

#	Perspective	Critical success factors	Performance measures	Target
1	Financial	Profitability	Profit/profit margin; Return on investment	
		Liquidity (short-term solvency)	Cash flow level; Level of receivables	
		Growth	Revenue growth rate.	
		Stability (long-term solvency)	Level of debt	
2	Customer	Client or customer satisfaction	Customer satisfaction ratings	
		Return on customer relationships	Percentage of repeat business customers; Organization (corporate) image	
		Customer acquisition	Number of new clients or customers; Client/customer growth.	
3	Internal business processes	Quality of service/product	Response time to business issues; Level of defeats or errors.	
		Process management Information & equipment technology utilisation	Processing time; Percentage of expenses to total sales revenue; Construction productivity rate; tenders' success rate; Number of meetings.	
		Risk management	Risk management responses; Risk or safety levels.	
4	Learning & growth	Organizational competency	Staff competency/skills coverage ratio.	
		Leadership	Leadership competency level.	
		Employee learning & development	Percentage of employees with computers; Employee satisfaction rating; Employee productivity rate; Recognizing & rewarding employee; Training days per employee	
		Information technology (IT) competency	Level of IT application in construction; Investment in IT for construction.	
5	Supplier	Supplier management	Level of supplier's defect-free deliveries; Percentage of on-time supplier deliveries; Level of supplier satisfaction; Level of flexibility; Supplier lead-time against industry norms.	
		Procurement/contract management	Level of contract compliance.	
6	Project	Project management	Quality of workmanship and final product; Actual cost Vs budgeted costs; Client's satisfaction; Time of delivery against agreed standards; Project productivity rate; Level of project safety; Project profit margin.	
7	Environment & community	Sustainability	Level of environmental compliance; Energy consumption; Water consumption; Number of jobs created; Contribution to the local community; Waste and scrap level.	

Review - ongoing & periodic
Data/information and analysis

Figure 8.3 Final version of proposed conceptual framework

8.3.5.2.6 The need for the application the CPMM framework in construction

Saint Lucian construction firms could implement and use the proposed CPMM conceptual framework, presented in this study, to better measure and manage their performance. The new CPMM framework integrates both financial and non-financial performance measures and can be is aligned with organizational strategy. It captures the CSFs in the Saint Lucian construction industry that will ensure successful competitive performance for the construction firms and can be integrated with other management systems and routines. The successfully implementation of the proposed CPMM framework within construction firms would provide benefits (see section 8.3.5.2.3) to them and the industry as a whole.

By better measurement and management of performance, construction firms are expected to achieve better performance outcomes in terms of strategic alignment and thinking, overall performance improvement, demonstrating greater accountability and organizational learning and ultimately improve in their PMM practice. It should be noted that the Saint Lucian construction industry experts highlighted these benefits (see section 8.3.5.2.3). Compared with traditional PM frameworks, the final BSC framework presented in this would allow Saint Lucian construction firms to assess both their current performance and future performance.

Most CPMM frameworks previously use in the construction industry have focused on evaluating either the performance at project level or organizational level. Recognizing that the construction industry is made-up of project-based organizations, this proposed CPMM conceptual framework is designed to simultaneously capture and integrate both project performance and firm performance. This would improve on the evaluation of the construction industry. Some construction management researchers (e.g. Yu et al., 2007; Willar, 2017) also suggested this.

Meanwhile, some construction management researchers (e.g. Kagioglou et al., 2001; Yu et al., 2007; Luu et al., 2008; Bassioni et al., 2008) have primarily focused on designing and developing conceptual frameworks to provide an understanding of the performance of construction firms. In addition to the developed conceptual framework, this study provides practicing managers with insights on the factors that could influence the effectiveness of the implementation and usage of CPMM framework within their construction firms.

Taking the needs and characteristics of the construction industry into considerations (Kagioglou et al., 2001; Bassion et al., 2005), the proposed CPMM framework includes seven performance perspectives namely financial, customer, internal business process, growth and learning, supplier, project and environment and community perspectives. Compared with CPMM frameworks, in particular BSC frameworks proposed for the construction industry (e.g. Kagioglou et al., 2001; Yu et al., 2007; Chan, 2009; Luu et al., 2008; Jin et al., 2013), environment and community perspective was not considered in the previously proposed CPMM frameworks. As mentioned earlier, there is growing evidence that aspects of environmental and community performance are becoming important to construction firms, their clients, investors, society and other key stakeholders. This is because construction projects and activities have profound impacts on the environment and communities (Anihashemi et al., 2017). This in turn has triggered the need for construction firms to develop and incorporate appropriate performance measures within their PMM framework that reflect their environmental and community (social) sustainability objectives and targets (Taticchi et al., 2015). Furthermore, there is a need for construction firms Saint Lucian to incorporate all three dimensions of sustainability, namely economic, social and environmental dimensions in their PMM frameworks (Taticchi et al., 2015) and their decision making process.

Accordingly, the final BSC conceptual framework in this study is a novel as it can help to evaluate the environmental and community performance of construction firms and is more appropriate to the industry. The proposed conceptual framework provides practicing managers and researchers a more holistic coverage of sustainability in fulfilling stakeholder requirements by including environmental and community aspects along with economic aspects within it. Accordingly, it will contribute to a financially, socially, and environmentally sustainable construction industry in Saint Lucia that will better meet the needs and expectations of their clients and other stakeholders.

8.4 Chapter summary

The development of the conceptual framework was achieved through literature review, questionnaire survey and case study conducted in the construction industry in Saint Lucia. Further, the validation of the proposed CPMM framework was achieved through experts' opinions received on the acceptability of the framework in the construction industry. The next chapter presents the conclusion of the study.

Chapter 9 Conclusion

9.1 Introduction

This final chapter presents how the research has fulfilled its aim and objectives. The research investigates the current state of PMM practice within construction firms in Saint Lucia, a developing country. In addition to the literature, the study employs the mixed methods research based on both data and methodological triangulation. The research data were collected through quantitative (questionnaire survey) and qualitative (two case studies) methods. Interesting findings have been derived from both the theoretical and empirical parts of the study. The empirical findings of the study were synthase within the literature. The conclusions drawn from research findings are discussed in relation to the research aim and objectives. The chapter also presents the contribution of this research to the body of knowledge and practice in the area of PMM. Recommendations for the practice or the application of the proposed CPMM framework in Saint Lucian construction firms as well recommendation for further research are also presented in this chapter. Finally, the limitations of the study were highlighted in this chapter.

9.2 Realization of research aim

The overarching aim for this study was stated in chapter 1 (section 1.3) as: to develop a CPMM conceptual framework to better measure and evaluate the performance of Saint Lucian construction firms. The research aim was achieved as follows. The findings and conclusions from literature review (chapter 2) identified the variables and themes that were incorporated into initial CPMM framework developed (figure 8.1), which was then refined (figure 8.2) based on the findings from the empirical evidence of the study. Furthermore, the refined CPMM framework was validated through structured and semi-structured interviews to give the final version (validated) CPMM framework (8.3).

9.3 Realization of objectives

As mentioned earlier, the study investigates key aspects and issues of PMM practices in the context of the Saint Lucian construction industry. The research findings are evaluated in relation to the

objectives set out to achieve the research aim. The conclusions drawn from the findings of the study are presented underneath the research objectives as follows.

9.3.1 Objective 1: Importance of PMM

This objective was achieved after extensive review of the literature in PMM and other related subject areas. The overall findings concludes that PMM is important to business organizations and in particular to construction firms for measuring, evaluating and managing their performance. Moreover, the study concludes that a CPMM framework is a set of performance perspectives, CSFs and performance measures use by business organizations to evaluate their performance and strategies. It was also found that the BSC framework is the most widely used CPMM framework by business organizations. In particular, the study reveals that BSC, KPI and EFQM excellence model are the three most widely adopted CPMM frameworks within the construction firms for measuring, evaluating and managing their performance.

The literature recommends the use of an evolutionary lifecycle approach to the development of organizations' CPMM frameworks from design, through to implementation, use and review. However, literature concludes that design stage of a PMM framework has received the greatest attention. The study considered several aspects across the life cycle of a PMM framework from design to use for the construct industry.

For the design stage, the study concludes that there are several perspectives and performance measures that are applicable to the construction industry. Most specifically, seven (7) perspectives and 63 performance measures were identified from the literature to empirically test in the Saint Lucian construction industry for inclusion in a conceptual framework.

For the implementation and use, the study concludes that business organizations are using performance measures of a PMM framework for several different purposes to achieve their objectives including inter alia measuring and evaluating performance, strategy management and learning and improvement.

9.3.2 Objective 2: Assessing performance and their uses of measures

9.3.2.1 Assessing performance of Saint Lucian construction firms

To address this objective, mean ranking analysis and factor analysis of the questionnaire responses from 34 Saint Lucian construction firms were used to provide empirical evidence. Building on these results, the multiple case study of two Saint Lucian construction firms were conducted to provide more evidence and to elaborate on the quantitative results. In this regard, this objective has been achieved.

This study concludes that Saint Lucian construction firms could use performance perspectives, CSFs, performance measures and performance targets to evaluate their performance. In this regard, the study identifies the seven (7) BSC perspectives namely financial, customer, internal business process, learning and growth, supplier project and environment and community perspectives are relevant for performance evaluation of Saint Lucian construction firms. The study findings reveal that Saint Lucian construction firms are making more use of their performance measures within the project and internal business process perspectives. Moreover, the study concludes that Saint Lucian construction firms utilise both financial and nonfinancial performance measures to evaluate their performance. The identified and confirmed performance measures in this study resonate within all seven (7) BSC perspectives. The study also incorporates the identified performance measures in a proposed conceptual framework. Furthermore, it can be deducted that Saint Lucian construction firms are placing more emphasis on non-financial performance measures than financial performance measures. Quality of workmanship and final product, cash flow level, and customer satisfaction are among the most extensively used performance measures by Saint Lucian construction firms.

This study identifies and prioritizes the critical success factors (CSFs) of Saint Lucian construction firms mainly using the two case studies. The research findings reveals ten (10) important CSFs of Saint Lucian construction firms including client/customer satisfaction, organizational competency, quality of service and product, project management, among others. The study further reports that

the firms in Saint Lucian construction industry have been setting targets for their key performance measures.

The factor analysis was performed to examine underlying measures within identified performance perspectives and summarizes the perspectives of performance measures of the Saint Lucian construction firms into seven (7) principal components (factors) for the evaluation of their performance. They include employee and customer perspective, supplier perspective, business efficiency and growth perspective, project perspective, innovation perspective, environment perspective and process management perspective. The results of the factor analysis reveals that supplier perspective and project perspective were retained in relation to the original above seven BSC perspectives in the proposed conceptual framework (see figure 8.1).

9.3.2.2 Types of use of performances measures

This study examines the use of performance measures by Saint Lucian construction firms, using the typology of Franco-Santos et al. (2007) plus one additional category, managing risk. Moreover, the study uses mean ranking analysis and factor analysis of the questionnaire responses from 34 Saint Lucian construction firms and 2 case studies to provide empirical evidence on their use of performance measures. Accordingly, this objective has been fully met in this study.

In particular, the research findings conclude that Saint Lucian construction firms are using their performance measures for a wide range of purposes and therefore are making effective use of their PMM frameworks or performance measures. Measure performance use, strategy management use and managing risk are some important uses identified prior to the factor analysis.

The factor analysis summarizes the uses of performance measures by Saint Lucian construction firms into six principal components (factors) namely monitoring and evaluating performance use, strategy management use, managing risk use, governance and learning use, benchmarking use and rewarding behaviour use. This demonstrates that they are using their performance measures for operational, tactical and strategic purposes. Furthermore, the results of the factor analysis reveals that measure (monitoring and evaluating) performance use, strategy management use and

managing risk use were the three use categories retained in relation to the original six use categories identified in the literature review (see section 2.6.3).

9.3.3 Objective 3: Developing performance measures

This study concludes that the Saint Lucian construction firms develop their performance measures to a considerable extent from their strategy and policy development process. Additionally, they use CSFs and existing frameworks to a considerable extent to develop their performance measures.

9.3.4 Objective 4: PMM frameworks adopted

The study uses mean ranking analysis and factor analysis of the questionnaire responses from 34 Saint Lucian construction firms and multiple case study of two Saint Lucian construction firms to provide empirical evidence on the PMM framework adopted by them. This objective was successfully addressed in this study.

Empirical evidence reveals that Saint Lucian construction firms have developed and are using their own internal PMM frameworks to evaluate their performance. Generally, the PMM framework of Saint Lucian construction firm is a miscegenation of aspects of different PMM frameworks. While the level of usage of multi-dimensional performance measures is considerable high among the Saint Lucian construction firms, the adoption of CPMM frameworks such as the BSC is scarce.

As already mentioned, Saint Lucian construction firms are using both financial and non-financial performance measures to evaluate and manage their performance, which are implicitly or explicitly link to strategy. It is reasonable to conclude that Saint Lucian construction firms are at least using PMM frameworks that are similar to Speckbacher's et al, (2003) Type I BSC or Type I BSC (see section 2.6.4).

9.3.5 Objective 5: Barriers to, and strategies for CPMM framework implementation

The study uses mean ranking analysis and factor analysis of the questionnaire responses from 34 Saint Lucian construction firms and multiple case study of two construction firms in Saint Lucia to provide empirical evidence on the barriers to CPMM framework implementation. This objective was successfully addressed in this study.

The research findings evince considerable insight into the barriers that impede the successful implementation of a CPMM within Saint Lucian construction firms. Therefore, they should focus their attention on addressing the identified significant barriers to CPMM framework implementation. Moreover, the study confirms that internal barriers are more important to Saint Lucian construction firms than external barriers. Accordingly, the study identifies eight (8) important internal barriers that could impede the successful implementation of CPMM framework within Saint Lucian construction firms. They include higher implementation costs, inadequate resources for CPMM implementation, inappropriate organizational culture, among others. On the other hand, the study confirms that economic downturn and uncertainty and political uncertainty as the two most important external barriers for the implementation of a CPMM framework.

The study has applied multiple case study of two construction firms in Saint Lucia to provide empirical evidence on the strategies to overcome barriers that impede the successful implementation of a CPMM framework within Saint Lucian construction firms. This objective has been successfully addressed in this study.

The study has identified and prioritized strategies to overcome barriers that impede the successful implementation of a CPMM framework within Saint Lucian construction firms. The findings show that education and training, leadership and top management commitment, a supportive culture for PMM, and gaining people's buy-in and involvement in a CPMM framework implementation process are perceived to be the four (4) most important strategies or solutions to overcome CPMM framework implementation barriers.

The factor analysis with PCA extraction was performed to explore the underlying categories or dimensions of barriers to the successful implementation of CPMM framework in the Saint Lucian construction firms. The PCA summaries all the identified barriers to the implementation of a CPMM framework in the Saint Lucian construction industry into three principal components (factors), namely commitment and culture barrier, organizational background and resources, and external barrier. It can be recognized that internal barriers to CPMM framework implementation was split into two principal components.

9.3.6 Objective 6: Development of a PMM conceptual framework

To address this objective, an extensive literature review was undertaken to develop an initial conceptual frameworks (see Chapters 2 and 8). This CPMM framework was refined with the findings of the questionnaire survey of construction managers and two case studies within the Saint Lucian construction industry. Figure 8.2 shows the proposed refined BSC conceptual framework at this this stage and therefore this research objective has been fulfilled.

9.3.7 Objective 7: Validation of developed PMM conceptual framework

In order to achieve this objective, the refined proposed conceptual framework was validated through structured and semi-structured interviews with experts in the Saint Lucian construction industry. Consequently, the proposed conceptual framework was further refined and developed after gathering and analyzing the data from the validation stage of the research to formulate the final version or validated proposed conceptual framework (see figure 8.3). This conceptual framework has been proposed for Saint Lucian construction firms to better measure and evaluate their performance. Therefore, this objective has been met.

9.4. Contribution to knowledge and practice

This study contributes to body of knowledge of PMM through the development and validation of CPMM framework for Saint Lucian construction firms to better measure and manager their performance. The framework will provide a systematic and structured way of evaluating the performance of construction firms. It could provide a broader range of financial and non-financial performance measures. This would ultimately lead to improvements in performance of Saint Lucian construction firms. Further, the study proposes a set of CSFs that would enable construction firms to recognize the most crucial business areas to focus their attention and allocate resources in an efficient manner to realize business success.

Previous studies on PMM in construction have focused on the development of conceptual frameworks for either projects or firms. In this study, however, the proposed conceptual framework captures the firm's performance as well as project performance. It provides managers of Saint Lucian construction firms with an understanding of the need for and role of PMM in construction in order to assist them in achieving organizational objectives and strategies.

Another contribution of this study is that it will document the current PMM practices in construction firms in Saint Lucia and therefore will provide practitioners guidelines in their CPMM implementation and usage efforts. In particular, the findings provides both internal and external barriers to the implementation of a CPMM framework within Saint Lucian construction firms. Moreover, the findings of this study would be a step towards filling this gap of the limited research that has been undertaken in the context of developing countries and in particular Saint Lucia.

In addition, the study makes recommendations to improve PMM practices in the Saint Lucian construction industry, which could be called KAZY. Accordingly, Saint Lucian construction firms should undertake the following to improve their practice of PMM: Knowledge – increase knowledge about CPMM in the industry, Adaptability to the business environment including adopting an adaptable corporate culture and developing and implementing organizational practices to respond to the changes in the business environment; Zealous towards achieving continuous improvement and the implementation of a CPMM framework; and Yielding excellence performance.

9.5 Recommendations for future action and future research

This section articulates some suggestions of specific actions required to implement a CPMM framework within the Saint Lucian construction industry. Further, it highlights some observations about potential future research.

9.5.1 Recommendations for adoption of the CPMM framework in construction

Based on the outcomes emanated from the research, the following recommendations are in relation to the adoption and use of the proposed BSC framework within the Saint Lucian construction firms. The implementation and use of the proposed CPMM framework may involve substantial changes within Saint Lucian construction firms. The previous findings have indicated that the effective implementation and use of CPMM framework would enable Saint Lucian construction firms to achieve their objectives such as improvement in their performance, competitiveness in the market and manage organizational changes. Accordingly, practicing construction managers within each construction firm would need to understand the recommended actions required for practical

implementation and use of the proposed CPMM framework. The following are some recommended actions that can be applied in the CPMM framework implementation and use stages by a Saint Lucian construction firm:

- It is recommended that practicing construction managers should give due consideration to this research findings. The rationale for this is that the research findings offer practicing managers an understanding and insight on some key aspects of the CPMM framework lifecycle, including the factors influencing the CPMM framework implementation. For example, the research findings provide the barriers that construction firms may encounter during the implementation phase.
- Since the BSC framework proposed in this study is generic and each organization has different characteristics, it is recommended that practicing managers of construction firms should implement and customize the proposed BSC framework to reflect their needs and context.
- It is recommended that construction firms develop a robust data collection and analysis system that would facilitate the effective monitoring and evaluation of their performance.
- It is recommended that construction firms that intend to implement the final BSC framework should consider it as a 'project' and therefore apply project methodologies to implement it. The CPMM implementation project can be designed into three phases, namely pre-project implementation, project implementation and post project implementation review. The requirements for each phase of the project are discussed below:

Pre-project implementation

1. The practicing construction managers should have a clear understanding of the need for the change and of the potential benefits (see section 8.3.2.5) of using the proposed BSC and communicate the mission and strategy of the construction firms to employees.
2. The construction firm should establish a steering committee, which appoints a project team, and identifies and selects consultants and expertise to undertake the implementation of the proposed CPMM framework.

3. Consultants, in conjunction with project team should prepare implementation plan and related implementation actions, strategy maps, and knowledge strategy, identify and discuss the training needs and plan for the project, explain the relevance and importance of proposed BSC framework to appropriate members of the firm and other key stakeholders.
4. The project team and/or consultants should conduct a SWOT analysis to identify its strengths and weaknesses in terms of its capabilities and resources, and its opportunities and threats in the external business environment.
5. The project team should consider behavioural and managerial routines such as monitoring cultural changes on an ongoing basis as well as support processes.
6. The project team can use a maturity model to assess its PMM maturity level (e.g. basic, intermediate, and advanced). The maturity assessment involves interviewing persons charged with governance, senior management and technical staff; reviewing internal reports; assessing the content, structural and process aspects of the firm's existing PMM framework. It also includes making observations of the actual processes in the form of a walkthrough test and detailed assessment of the framework/system(s); producing and submitting an assessment maturity report; discussing the findings and recommendations in the report with relevant members of the firm and agreeing on the PMM framework maturity level for the firm.
7. Based on the forgoing, the project team should considers a few alternative system or framework designs along the lines of the proposed BSC, and develop a customized or modified PMM framework that will fit the needs and requirements of the construction firm in term of its resources and strategic capabilities. The project team should incorporate some level of flexibility within customized framework to ensure that necessary changes can be made to the adopted framework in the future.
8. The project team should prepare a resource budget and conduct an evaluation or cost benefit analysis before implementing the customized BSC framework (or some phase{s} of the BSC framework).
9. The project team can present a visual (or graphical) representation and/or a prototype of the new CPMM framework to the relevant members of the construction firm. Visual scorecard dashboards, visual boards, roadmaps and templates can be used to provide a good

understanding of the customized CPMM framework and to influence behaviours of participants towards the achievable to the project and organizational objectives.

10. The project team will seek and obtain approval from the project steering committee for the project to go head.

Project implementation phase

11. Upon approval, the project team should select an implementation strategy or a combination of strategies appropriate to the circumstances of the firm (e.g. phased implementation, pilot implementation direct changeover and parallel running) and the implementation timescale.
12. The project team should procure the suitable physical resources such as appropriate ICT infrastructure and technologies (hardware, software, network, backup servers, data security, etc.) and other resources for the project.
13. The project team will implement the context-specific and customized BSC framework within the construction firm. The team should ensure alignment and integration of the framework with other management systems within the firm. It should monitor and track progress of the key project implementation activities to ensure that the framework is being implemented as was planned, continuously revising the framework to ensure it fits the firm's purpose, and resolving detected problems and an implementation issues.
14. Project team should prepare end of project review report that highlights the key implementation and operational issues and recommendations for future implementation of similar projects.
15. The team will close and hand over the project to steering committee or those charged with the governance of the construction firm.

Post project implementation review

16. The relevant managers (or consultants) of the construction firm should undertake a review of the entire CPMM framework to ensure the needs and expectations of the construction firm are met. The review report should include a review of the end of project results against expected results, a review of actual project costs and benefits against forecasted.

17. Documentation of lessons learned during the project can be beneficial for future projects and recommendations.

- Construction firms in Saint Lucian should engage in a continual dissemination of training programme on PMM such as workshops and brainstorming sessions to key stakeholders in the industry. This could increase the level of awareness and understanding of PMM in the Saint Lucian construction industry.
- It is recommended that key industry players should encourage higher educational institutions (HEIs) in Saint Lucia to incorporate PMM concepts in their curricula of related construction management programmes.

9.5.2 Recommendations for future research

This study has proposed a BSC framework for the Saint Lucian construction firms to use in measuring and managing their performance as well as provided information on the implementation and use of a CPMM framework. Clearly, there is scope for further research to build on the work in this study. The following are the recommendations for future study:

This study only was conducted in the Saint Lucian construction industry and its findings is highly relevant to and generalizable in this industry. There is an opportunity for future research to include other industries in order to learn whether generalization of the research findings is relevant in other settings. In the same vein, future research on PMM is needed in Saint Lucia and other developing countries to better understanding the evolution of CPMM framework like the BSC and to gain insight on its wider practical applicability. Moreover, the research could adopt a multiple approach to survey where more than one employee from one firm can participate in it. This could give more insight on the PMM in construction and increase the credibility of the findings.

The literature suggests that the characteristics of PMM can change over time and this may call for longitudinal research. This could provide a basis for a future study that could adopt action research approach, which lends itself well to longitudinal study methodology. Further research could examine a detailed evolution of PMM system/framework, focusing on its entire lifecycle and

thereby providing greater understanding and insights on how to design, implement, use and review it (Braz et al., 2011; Gutierrez et al., 2015) within construction firms. Additionally, in-depth investigation should be undertaken for each stage of the evolutionary cycle of the CPMM framework.

Furthermore, the relationship between the proposed BSC and other important factors or attributes can be investigated. For example, the scope of the current study could be extended to examine the relationship between a CPMM framework and performance as well as between a CPMM framework and key management systems such as HRM. Future research could also consider the empirical examination of the relationships among all variables in the proposed BSC framework. In addition, future research could examine the relationship between adoption of the proposed BSC and the contingent factors (e.g. strategy and organizational structure).

The successful implementation of this proposed BSC requires an appropriate organization culture. Therefore, additional research through longitudinal research can be undertaken to explore the impact of organizational culture on the use of the proposed BSC and therefore could improve findings of this cross-sectional study.

PMM is a complex phenomenon and therefore additional research on complex dynamics and systems dynamics should be undertaking to understand the impact of the adoption of the proposed BSC in other business sectors.

Due to resource and time constraint, the study could not have explored the actual implementation of the proposed BSC framework within construction firms in Saint Lucia. Another possible avenue for future research is the investigation of the actual implementation of the proposed BSC framework in the industry. In so doing, the research can adopt a longitudinal research, in which action research and case study are appropriate research strategies to carry out this investigation.

9.6 Limitations of the study

Like all research, there are limitations in this study, discussion of which are presented below.

Firstly, the sample of this study is drawn from only construction firms in Saint Lucia. It is acknowledge that the construction industry environment or context may differ from country to country (Lizarralde et al., 2013), which impacts on organizations' PMM and performance. Besides that, previous research has noted that PMM systems and their components may differ in different geographical contexts as well as in other organizational settings (Bititci et al., 2012; Franco-Santos et al., 2012; Micheli and Mura, 2017). Therefore, generalizations of these research findings beyond the Saint Lucian setting would have to be considered cautiously and should be investigated.

Secondly, this study utilizes only cross-sectional research methodology. The longitudinal research was not explored.

Another limitation of the study is it that the strategies to overcome barriers that impede the successful implementation of a CPMM framework within Saint Lucian construction firms were explored from the two case studies. Therefore, considering viewpoints from a large sample might enhance the credibility of the research findings presented here.

Factor analysis was the only multi-variate analysis test conducted in this research. Using other methods of multi-variate analysis, such as structural equation modelling analysis to measure accurately the relationships between proposed BSC framework components could increase the reliability and viability of the study.

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Appendices

Appendix A: Organization management consent letter

Sylvester Joseph Sonson
La Clery Castries
Saint Lucia
Email address: sjsonson@hotmail.com
Telephone # 1758-7163106/7174083

2017

Managing Director/Chief Executive Officer
St Lucia

Reference: Organization Management Consent Letter

Dear Sir/Madam

I am a postgraduate research student of the University of Salford, Manchester in the UK. As part of my research study, I am undertaking a dissertation titled: Performance measurement in construction firms in Saint Lucia. Construction firms in this study are defined as firms that undertake construction of civil or building works, and provide professional construction related services. Therefore, I would like to include your organization as one of several organizations to be involved in my study. In this study, questionnaire and interviews have been identified as the key data collection techniques and you can be involved in one or both techniques. Additionally, an analysis of relevant documents concerning your organization's performance measurement such as strategic plan, annual and technical progress reports, and minutes of official meetings, among others is a crucial research method to generate useful data for this research.

The purpose of this study is to explore performance measurement (PM) within construction firms to develop a conceptual PM framework to better measure and evaluate their business performance. The specific objectives of this study include: to identify and assess performance measures peculiar to the construction organizations in Saint Lucia, and their uses; to evaluate PM frameworks in use in construction organizations in Saint Lucia; to identify and evaluate barriers to the implementation of contemporary PM frameworks within construction firms in Saint Lucia; and then develop a new PM framework that enable them to better measure and evaluate their performance.

Prior to undertaking the research study I need your agreement/consent to access your organization's relevant documents and to approach the senior managers such Chief Executive Officer (CEO), managing director, principal, managing partner, and other managers within your organization to take part in the study. Senior managers will be selected for the study because they are assumed to have adequate knowledge and understanding of performance measurement and management of their organizations and the key issues confronting the construction industry as a whole.

I will recruit research participants for the study upon gaining informed consent. It is important to mention that participation in this study is entirely voluntary and a research participant can withdraw at any time without prejudice and without giving a reason. If you decide to withdraw from the study, then any information and data collected from you, to date, will be destroyed.

With the questionnaire survey, the return of a completed questionnaire by a respondent will be taken as implied consent. I have attached a copy of participant information sheet (**appendix B**) as well as research participant consent form (**appendix C**) for your information. I hope to recruit a total of 47 participants in the study. Furthermore, I plan to interview two or more participants within each of the chosen case study firms in the construction industry.

I can firmly assure you that the study will not disrupt the working environment in any way, any data collected from your organization will be treated and kept in the strictest confidentiality and will be used for research purposes only, and individual participants and organizations will remain anonymous. I have gained ethical approval for the study from the University of Salford.

The results of the study will be summarised and reported in the dissertation. A summary report of the results of the study will be made available to the participant organizations or individuals upon request. Furthermore, participants and individual organizations will not be identified in any report/publication produced.

My research is supervised by Dr. Udayangani Kulatunga, PhD, and her email address is u.kulatunga@salford.ac.uk.

I would be most grateful if you could detach & complete the attached organization management consent form below (**See appendix A**) and return it via email to confirm your organization's agreement/consent to participate in the study, and therefore for me to approach and recruit the top or senior managers of organization for this study.

Thank you very much for your time and in anticipation of your assistance in this study. Should you require clarification and any further information about the study, please do not hesitate to contact me via email sjsonson@hotmail.com or cell phone # 716-3106/7174083.

Yours sincerely

Sylvester J Sonson
Research student, University of Salford
Contact email: sjsonson@hotmail.com

Appendix B: Organizational management consent form

Research, Innovation and Academic Engagement
Ethical Approval Panel
University of Salford
Manchester, UK

Organization Management consent form

This is to certify that I have given consent to the postgraduate researcher, Mr. Sylvester J Sonson of the University of Salford to conduct his research at our organization, and therefore to access my organization's performance measurement documents and to approach the top or senior managers of my organization to participate in the study on performance measurement in the construction firms in Saint Lucia.

Name of firm: _____

Name of authorized person: _____

Job Title of authorized person: _____

Signature of authorized person: _____

Date: _____

Appendix C: Participant information sheet Research

Participant information sheet

Dear Participant,

I am a postgraduate research student of the University of Salford, Manchester in the United Kingdom. As part of my research study, I am undertaking a dissertation titled: Performance measurement in construction firms in Saint Lucia. In the study, questionnaire and interviews have been identified as the key data collection techniques and you can be involved in one or both techniques. Additionally, an analysis of relevant documents concerning your organization's performance measurement such as strategic plan, annual and technical progress reports, and minutes of official meetings, among others is a crucial research method to generate useful data for this research.

The purpose of this study is to explore performance measurement (PM) within construction firms to develop a conceptual PM framework to better measure and evaluate their business performance. The specific objectives of this study include: to identify and assess performance measures peculiar to the construction organizations in Saint Lucia, and their uses; to evaluate PM frameworks in use in construction organizations in Saint Lucia; to identify and evaluate barriers to the implementation of contemporary PM frameworks within construction firms in Saint Lucia; and then develop a new PM framework that enable them to better measure and evaluate their performance.

To date, very few studies have been undertaken in the field of performance measurement in St. Lucia and therefore your participation will provide invaluable insight into a research and practical area of growing importance in recent years. One of the key to the success of this research is the achievement of high or an acceptable participation rate. In this regard, I would like to invite you to take part in this research study.

It should be noted that you were chosen because you as a manager, are assumed to have adequate knowledge and understanding of performance measurement and management in your organization and the general issues facing the construction industry. However, your participation in the research is entirely voluntary and you can withdraw at any time without prejudice and without giving a reason. If you decide to withdraw from the study, then all the information and data collected from you, to date, will be destroyed.

I cannot promise you that your participation in this study will benefit you personally but the data and information you will provide can contribute to the development of a PM framework that will be used by organizations in the construction industry in St. Lucia and beyond. So far I am unable to identify any serious potential risks of your participation in this study. However if I identify any serious potential risks during the course of the study I will take the necessary measures to minimize their impact.

I can assure you that the data collected from you will be treated with the strictest confidentiality and used solely for the purpose of the study, and in accordance with academic standards and practices. I have gained ethical approval for the study from the University of Salford.

The results of the study will be summarised and reported in the dissertation. A summary report of the results of the study will be made available to the participants upon request. Furthermore, your identity and the identity of your firm will remain anonymous in all reports/publications and presentations of the results.

I will be most grateful if you could confirm that you understand the purpose of the study and your involvement in it, and that you have no objection to your participation by completing and signing the attached participant consent form.

Should you have any queries regarding the research or require further information, please do not hesitate to contact me via email sjsonson@hotmail.com or on cell phone # 7163106/7174083.

My research is supervised by Dr. Udayangani Kulatunga, PhD, and her email address is u.kulatunga@salford.ac.uk.

I would like to take this opportunity to thank you in advance for your time and in anticipation of your assistance in this study.

Yours sincerely

Sylvester J Sonson
Research student, University of Salford
Contact email: sjsonson@hotmail.com

Appendix D: Research participant consent form

Research Participant Consent Form

Title of Project: performance measurement (PM) in construction firms in Saint Lucia.

Name of Researcher: Sylvester J Sonson

Name of Supervisor: Dr. Udayangani Kulatunga, PhD

• I confirm that I have read and understood the information sheet for the above study and what my contribution will be.	**Yes**	**No**

• I have been given the opportunity to ask questions (face to face, via telephone or e-mail).	**Yes**	**No**

• I agree to take part in the interview.	**Yes**	**No**	**NA**

• I agree to the interview being audio recorded.	**Yes**	**No**	**NA**

• I understand that my participation is voluntary and that I can withdraw from the research at any time without giving any reason.	**Yes**	**No**

• **I agree to take part in the above study**	**Yes**	**No**

• I agree to obtain a copy of the summary report of the results of the study upon its completion.	**Yes**	**No**

Name of participant:

Participant's Signature

Date

Name of researcher: Sylvester J Sonson

Researcher's e-mail address: sjsonson@hotmail.com

Appendix E: Questionnaire Survey

Questionnaire Survey

Performance measurement within construction firms in St. Lucia.

2017

This questionnaire survey is part of my research method that will contribute to the fulfillment of my postgraduate research dissertation titled: Performance measurement within the construction firms in St. Lucia.

The collected primary data from this survey shall only be used for academic research purpose and will be handled with the utmost care and confidentiality. I can assure you that your name as well as your organization's name will be kept confidential.

Instructions: Please complete all questions and statements below by placing an **X** that corresponds to your choices in the appropriate boxes.

Section 1: Personal and business information

This section seeks to obtain information about you and your organization.

1. What is your highest level of education?

Education level	Place an **X**
Master's Degree	
Professional (e.g. RICS, CIOB, CEng) Specify	
Post graduate Diploma	
Bachelor's Degree	
Diploma	
Other	

2. State the number of years you have been working in the construction industry.

Years	Place an **X**
21 and over	
16 to 20	
11 to 15	
6 to10	
5 and below	

3. State the number of years you have been working in the firm.

Years of service/tenure	Place an **X**
21 and over	
16 and over	
11 to 15	
6 to10	
5 and below	

4. What is the current position or title you hold in the firm?

Position held	Place an **X**
General Manger/chief executive officer	
Principal	
Managing Director	
Construction manager	
Finance manager	
Project manager	
Engineer	
Other	

Section 2: Performance measurement practices

2.1 Types of performance measures

The following section seeks information on the extent of use of financial and non-financial performance measures by management in your organization.

A critical success factors (CSF) is a particular factor, which is considered to be integral to the success of an organization (or a business unit or a project).

5. Please rate the extent to which each of the following performance measures under each of seven perspectives is used in your organization. (Please place an X for your choices in the appropriate boxes).

Sub-Section I: Financial measures (A)

Notes to A:
Critical success factors (CSFs): **P**: Profitability, **L:** Liquidity, **G**: Growth and **S:** Stability.

A	**Financial perspective (1)**		**To a very great extent** (5)	**Considerable extent** (4)	**Somewhat** (3)	**A little** (2)	**Not at all** (1)
	CSF	**Measure**					
1	**P**	Profit or Net profit margin (%) – Net profit after taxes ÷ Sales (turnover) revenue					
		Return on Investment (%) - Net profit after taxes ÷ Net assets employed					
2	**L**	Current ratio (times) - Current assets ÷ Current liabilities					
		Cash flow level					
		Receivables level					
3	**G**	Net sales (turnover) growth rate (%)					
		Net profit growth rate (%)					
4	**S**	Level of debt (indebtedness)					
		Debt ratio -Total debt ÷ Total assets ratio (%)					
		Interest coverage ratio (times) - Net profit or income ÷ interest					

Sub-section II: Non-financial measures (B, C, D, E, F & G)
Notes to B:
Critical success factors (CSFs): CS = customer satisfaction; **CA**= Customer acquisition; **RCR**= Return on customer relationships.

B	**Customer perspective (2)**		**To a very great extent** (5)	**Considerable extent** (4)	**Somewhat** (3)	**A little** (2)	**Not at all** (1)
	CSF	**Measure**					
1	**CS**	Customer or client satisfaction rating					
		Number of complaints from customers					
2	**CA**	Number of new customers/clients					
		Customer or client growth					
		Number of customer improvement suggestions					
3	**RCR**	% of repeat customers/clients					
		% of market share - your total turnover ÷ total industry turnover					
		Organization (corporate) image rating					

Notes to C:
Critical success factors (CSFs): **QS**= Quality of service; **PrM.** = process management; **Safety** = Safety; **Risk Mgt.** = risk management.

C	**Internal business process perspective (3)**		**To a very great extent** (5)	**Considerable extent** (4)	**Somewhat** (3)	**A little** (2)	**Not at all** (1)
	CSF	**Measure**					
1	**Quality**	Response time to key quality and/or other business issues					
		Level of defects or errors					
2	**ProM.**	Processing time					
		% of expenses to total sales (turnover) revenue					
		Tender success rate					
		Construction productivity rate (ratio of outputs to inputs)					
3	**Safety**	Accident rate/level					
		Time loss to accidents					
		Safety & health audit					
4	**Risk Mgt.**	No. of risk management meetings					
		Risk management responses					
		Risk assessment review					
		Risk scores for core construction business activities					

Notes to D:
Critical success factors (CSFs): Emp. = Employees; **OC =** Organizational Competency**; TC**: Technology competency.
Competency coverage ratio is the percentage of necessary skills or qualified employees the organization has to meet its anticipated business needs.

Knowledge management is the process of systematically identifying, creating, sharing, and using knowledge within the organization to enhance its performance.

IT = information technology

D	**Learning & growth perspective (4)**		**To a very great extent** (5)	**Considerable extent** (4)	**Somewhat** (3)	**A little** (2)	**Not at all** (1)
	CSF	**Measure**					
1	**Emp.**	Employee satisfaction rating					
		% of employee with degrees					
		Training hours per employee per year					
		Employee productivity rate (Output per employee)					
		Employee absenteeism rate					
		Recognizing & rewarding employee for outstanding performance					
		Number of employee improvement suggestions					
2	**OC**	Competency coverage ratio					
		Investment in leadership development					
		Investment in Knowledge management efforts					
3	**TC**	Level of IT application in construction					
		Investment in IT in construction					
		% of employees using computers in construction					

Notes to E:
Critical success factor (CSF): SM = Supplier management.
Flexibility involves responding to your changes in terms of product design, delivery times, specifications or volume requirements, and product and service variety (mix).

E	**Supplier perspective (5)**		**To a very great extent** (5)	**Considerable extent** (4)	**Somewhat** (3)	**A little** (2)	**Not at all** (1)
	CSF	**Measure**					
1	**SM**	Level of supplier's defect-free deliveries					
		Percentage of on-time supplier deliveries					
		Supplier lead time against industry norm					
		Level of supplier satisfaction					
		Level of flexibility					
		Number of innovative suggestions from suppliers					

Notes to F:
Critical success factor (CSF): PrM. = Project management.

F	**Project perspective (6)**		**To a very great extent** (5)	**Considerable extent** (4)	**Somewhat** (3)	**A little** (2)	**Not at all** (1)
	CSF	**Measure**					
1	**PrM.**	Time of delivery against agreed standards					
		Actual costs vs Budgeted costs					
		Quality of workmanship and product (e.g. level of defects or errors)					
		Project profit margin					
		Project productivity rate					
		Client satisfaction rating of project					
		Level of project safety					

Notes to G:
Critical success factor (CSF): Sust. = Sustainability.

G	Environment & community perspective (7)		To a very great extent (5)	Considerable extent (4)	Somewhat (3)	A little (2)	Not at all (1)
	CSF	**Measure**					
1	**Sust.**	Level of environmental compliance					
		Energy consumption					
		Water consumption					
		wastage and scrap rate/level					
		Number of jobs created					
		Contribution to the local community					

2.2 Types of PM frameworks in use:

This section seeks information on PM frameworks used by your organization.

6. Please indicate which performance measurement system/framework (containing performance measures) that is adopted by your organization to measure business performance. (Please place an X for your choices in the appropriate boxes).

PM framework	Place **X**
Balanced Scorecard	
Construction industry Key Performance Indictors (KPIs)	
European Foundation for Quality Management (EFQM) Excellence Model	
Performance prism	
Performance pyramid	
Results and Determinant Framework	
Our own developed Key Performance Indictors (KPIs) or framework	
Other, please specify:	

2.3 The uses of performance measures in a performance measurement (PM) framework

7. Please rate the extent to which the performance measures in your organization's PM framework are being used for. (Please place an **X** for your choices in the appropriate boxes in A, B, C, D, E, and F). They are for….

A	**Measure performance**	**To a very great extent** (5)	**Considerable extent** (4)	**Somewhat** (3)	**A little** (2)	**Not at all** (1)
1	Monitoring progress towards achieving objectives					
2	Evaluating performance					
3	Learning existing work practices					

The performance measures in your organization are being used for…

B	**Strategy management**	**To a very great extent** (5)	**Considerable extent** (4)	**Somewhat** (3)	**A little** (2)	**Not at all** (1)
1	Strategic planning (formulation)					
2	Strategy implementation/execution					
3	Focusing attention on strategic aspects of business					
4	strategic decision making					
5	Strategic capabilities					
6	Managing strategic change					
7	Challenging strategic assumptions					

The performance measures in your organization are being used for…

C	**Communication**	**To a very great extent** (5)	**Considerable extent** (4)	**Somewhat** (3)	**A little** (2)	**Not at all** (1)
1	Internal communication to management & employees at all levels					
2	External communication to other stakeholders					
3	Benchmarking (comparing) among units & or with other firms					
4	Compliance with regulations					
5	Communication between head office and divisions					

The performance measures in your organization are being used for…

D	**Influence behaviour**	**To a very great extent** (5)	**Considerable extent** (4)	**Somewhat** (3)	**A little** (2)	**Not at all** (1)
1	Monitoring behavior via performance appraisal					
2	Motivation of organizational members					
3	Role understanding					
5	Cooperation and coordination					
6	Rewarding or compensating behaviour					
7	Managing relationships					

Notes to E: *Double-loop (high level) learning refers to questioning and challenging the operating norms, policies and rules that define effective performance and then change (or redefine) them to meet new situations or change as the wider environment changes. The performance measures in your organization are being used for...

E	**Learning and improvement**	**To a very great extent** (5)	**Considerable extent** (4)	**Somewhat** (3)	**A little** (2)	**Not at all** (1)
1	Performance feedback information					
2	Double-loop (high level)learning					
3	Performance improvement					
4	Improving firm's reputation					
5	Enhancing accountability					
6	Enhancing benchmarking practices					

Notes to F: Strategic risk refers to unexpected events that reduce the ability of an organization to implement its intended strategies; **Operational risk** refers to any unexpected events that affect the every-day activities of an organization; **Financial risk** is the risk resulting from an organization's financing decisions and exposure to the financial markets; **Project risk** refers to any unexpected event that, if occurs, will affect the achievement of the project objectives. The performance measures in your organization are being used for...

F	**Manage risks**	**To a very great extent** (5)	**Considerable extent** (4)	**Somewhat** (3)	**A little** (2)	**Not at all** (1)
1	Strategic risk					
2	Operational risk					
3	Financial risk					
4	Project risk					

2.4 Strategy-driven

8. Please rate the extent to which your organization's performance measures are derived from.
Please place an **X** in appropriate box for your choice).

F	**Strategy linkage**	**To a very great extent** (5)	**Considerable extent** (4)	**Somewhat** (3)	**A little** (2)	**Not at all** (1)
1	From strategy/policy development					
2	Other, please specify					

2.5 Barriers to the implementation of a new contemporary PMM framework

9. Please rate the extent to which the following barriers could inhibit (prevent) the successful implementation of a new or contemporary performance measurement and management Framework (CPMMF) containing both financial and non-financial measures in your organization. (Please place an **X** in appropriate box for your choice).

Notes: **PMM** - performance measurement & management; **IT**= information technology

	Barriers (Obstacles) to the implementation of a CPMM framework	**To a very great extent** (5)	**Considerable extent** (4)	**Somewhat** (3)	**A little** (2)	**Not at all** (1)
A	**Internal factors**					
1	Lack of top management support					
2	Lack of employees' involvement & participation					
3	Lack of knowledge & understanding of the concept of PMM					
4	Ambiguity or lack of understanding of the expected benefits from CPMMF					
5	Higher implementation costs					
6	Inadequate resources for CPMMF implementation					
7	Inadequacy of appropriate IT infrastructure support					
8	Lack of clear strategies &/or strategic alignment					
9	Business/firm size					
10	Inappropriate organizational culture					
B	**External factors**					
11	Low level of competition					
12	Legislation & regulation in the industry					
13	Reluctance to adopting new technologies					
14	Economic downturn					
15	Political uncertainty					
16	Social & ecological uncertainties					

Thank you for your participation!

Appendix F: Pilot study – Questionnaire Evaluation form

Pilot Study – Questionnaire

Evaluation Form

Dissertation titled: Performance measurement in construction firms in Saint Lucia.

Please review and then complete the questionnaire. Thereafter, provide your feedback on its reliability and validity. This will help me to make improvements to it prior to undertaking the main (full) study. It should be noted that this study and your responses are completely confidential.

Thank you once again for your participation in the pilot study. Should you have any queries or concerns about questionnaire survey, please do not hesitate to contact me at sjsonson@hotmail.com/716-3106.

Best regards

Sylvester Sonson

Researcher

Please tick the appropriate answer and provide additional comments where necessary in the space provided.

1. **Were the instructions clear and ease to follow?**

- **Yes**
- **No**

If No please specify

2. **Were the definitions and descriptions provided helpful?**

- **Yes**
- **No**

If no please specify

3. **What is your opinion of the design/structure of the questionnaire?**
- **Poor**
- **Satisfactory**
- **Very Good**
- **Excellent**

Comments

4. **What is your opinion of the clarity of questions?**
- **Poor**
- **Satisfactory**
- **Very Good**
- **Excellent**

Comments

5. **How long did it take you to complete this questionnaire? _____**

6. **What is your opinion on the length of the questionnaire?**
- **Much too long**
- **A little too long**
- **About right**
- **A little too short**
- **Much too short**

Comments

7. **Does the 5-point Likert scale sufficient for these questions?**

- **Yes**
- **No**

If no please specify

8. **Does the questionnaire contain any questions that are irrelevant to the subject matter or require refinement?**
    - **Yes**
    - **No**

If yes please specify

9. **Does the questionnaire omit a key issue pertaining to the subject matter?**

- **Yes**
- **No**

If yes please specify

10. **Did you have any difficulty in completing the questionnaire?**

- **Yes**
- **No**

If yes please specify

11. **Please make any additional comments regarding the questionnaire.**

Appendix G: Semi-structured interviews questions protocal

Interview questions

Section 1: Organization and participant background information

Name of firm: _____

Address of firm: _____

The annual turnover of your firm: _____

Please state the core business activities of firm. (You may have more than one choice).

Building construction	Civil Works	Professional Services

Please state your firm's markets. (You may have more than one choice).

Domestic market	Regional market	International market

Your Name (Optional):_____

Job Title: _____

Job tenure: _____

Your role and years involved in performance measurement: _____

_____

Telephone: _____ Email: _____

Section 2: Aim and objective of the interviews

Research Title:
Performance measurement within construction firms in Saint Lucia.

Aim research
The purpose of this study is to explore/investigate performance measurement (PM) within construction firms to develop a conceptual PM framework to better measure and evaluate their business performance.

Aim & Objective of interview
The aim of the interview is to gain in-depth understanding and insight on practices of performance measurement within construction firms in Saint Lucia. This interview is a major component of data collection for my Postgraduate research. The objective of the interview is to contribute towards the fulfilment of the following research objectives.

1. To assess why and up to what extent construction firms in Saint Lucia measure their performance;
2. To evaluate the extent to which construction firms in Saint Lucia use contemporary performance measurement and management (CPMM) frameworks;
3. To identify the extent to which performance measures of construction firms in Saint Lucia are derived;
4. To identify and evaluate barriers to the implementation of CPMM framework within the construction firms in Saint Lucia;
5. To develop and validate a new CPMM framework that is able to better measure and evaluate the performance of construction firms.

Researcher: […..]
Email address: […..]
University of Salford, Manchester, UK

Section 3: performance measurement and management (PMM) practices in construction firms in Saint Lucia

Interview questions
The following interview questions will be used solely for the purpose of academic research. All your responses will be treated in strict confidence.

The purposes of (or reasons for) using performance measures.

1. Why is your firm measuring performance?

The types of performance measures in use.

2. What are the key performance measures used by your firm under each of the following perspectives? Please weight the measures according to their relative importance in use.
   I. Financial perspective;
   II. Customer perspective;
   III. Internal business perspective;
   IV. Learning and growth perspective
   V. Project perspective
   VI. Supplier perspective;
   VII. Environment and community perspective;
   VIII. Other perspective (if being used).

A critical success factors (CSF) is a particular factor which is considered to be integral to the success of an organization (or a business unit or a project).

3. What do you identify as the critical success factors (key performance criteria) for successful competitive performance of your firm?

4. Does your firm set targets for its various performance measures? Please explain your answer. (Give some examples).

Development of performance measures in construction firms.

5. How are the performance measures of your organization derived?

Performance measurement and management frameworks used in firms in the industry.

6. What performance measurement framework does your firm currently use to measure its performance?

Barriers to, and strategies for the implementation of a contemporary performance measurement and management framework and strategies to overcome these barriers.

7. What are the key barriers your firm will encounter (or has encountered) in the successful implementation of a new contemporary performance measurement and management framework? What the key strategies that you can use to overcome the barriers

8. What are some ways/strategies that can be undertake to overcome the identified barriers in implementing a new contemporary performance measurement and management in your firm?

Recommendations for improvements.

9. What improvements in performance measurement and management practices would you like to undertake in your firm?

Closing

10. Do you have any other comments on this topic of performance measurement and management in construction industry?

Definitions:

Contemporary performance measurement and management (CPMM) framework consists of both financial and non-financial performance measures across a range of perspectives.

Critical success factors (CSFs) are the critical areas of a business that must go well if it is to attain its goals and strategy.

Appendix H: Interview protocol _validation of framework

Interview protocol for validation of proposed framework

Introduction

You have been selected to participate in this interview because you have been identified as someone who has extensive knowledge, experience and expertise in performance measurement and management in business organizations. The title of my research project is Performance Measurement within construction firms in Saint Lucia. This research focuses on exploring performance measurement and management (PMM) within construction firms to develop a conceptual CPMM framework to better measure and evaluate their business performance.

Framework validation aim and objectives

Validation Aim:

The aim of the framework validation is to confirm by industry players the acceptance of the proposed framework for measuring and evaluating the performance of construction firms in relation to its clarity, comprehensiveness, applicability and practicality.

Validation Objectives:

To achieve aim of the validation of the proposed framework, the following specific objectives are set:

- To identify participants' perceptions and opinions on the clarity, comprehensiveness, applicability and practicality of proposed framework and its elements;
- To identify possible ways of improving the proposed framework in relation to its clarity, comprehensiveness, applicability and practicality.

The results of the validation will be used to finalize the CPMM framework, which will be disseminated in the industry for use.

Interview sections:

The interview consists of the following four main sections: Section 1 covers background information; Section 2 covers the proposed framework; Section 3 covers elements of the proposed and Section 4, general comments on the proposed framework. Your responses from the interview will be used for academic research purposes only and will be held in strict confidence.

Thank you for your agreeing to participate in this interview.

[…..]
Postgraduate Researcher
Email address […..]
School of Built Environment
University of Salford, Manchester, UK

Interview questions– Framework validation

Section 1: Participant background information

What is/are?

The Name & Address of the firm you are employed: _____

_____

The core business activities of firm: _____

Your Name: _____

Your Job Title/position: _____

Your Job tenure: _____

Your Telephone #: _____ Email: _____

Section 2: Proposed CPMM Framework

What is the extent to which you agree on the clarity, comprehensiveness, applicability and practicality of the proposed contemporary performance measurement and management (CPMM) framework?

1. Please place an **X** in the appropriate box that best indicates your level of agreement for each of the statements below on the clarify of the PMF:

1	**Clarify of CPMM framework**	**Strongly agree** (5)	**Agree** (4)	**Neutral** (3)	**Disagree** (2)	**Strongly disagree** (1)
1.1	The proposed CPMM framework has a clear structure.					
1.2	Proposed CPMM framework contains clearly defined CSFs and performance measures.					
1.3	Words and terms used in CPMM framework are understandable.					
1.4	The framework is relatively easy to understand and use.					

2. Please place an **X** in the appropriate box that best indicates your level of agreement for each of the statements below on the comprehensiveness capability of the CPMM framework:

2	**Comprehensiveness of CPMM framework**	**Strongly agree** (5)	**Agree** (4)	**Neutral** (3)	**Disagree** (2)	**Strongly disagree** (1)
2.1	The proposed CPMM framework is comprehensive for measuring the performance and aligning with strategy of a construction firm					
2.2	The CPMM framework would provide information required to evaluate the performance and aligning with strategy of a construction firm.					
2.3	The framework contains sufficient important elements (perspectives, CSFs & measures) to comprehensively capture the performance a construction firm.					
2.4	The proposed CPMM framework contains both financial and non-financial performance measures					
2.5	The CPMM framework would reflect the needs of both internal and external stakeholders of the construction firms.					

3. Please place an **X** in the appropriate box that best indicates your level of agreement for each of the statements below in relation to the useful of the CPMM framework:

3	**Usefulness of CPMM framework**	**Strongly agree** (5)	**Agree** (4)	**Neutral** (3)	**Disagree** (2)	**Strongly disagree** (1)
3.1	A construction firm could use CPMM framework to provide a holistic (comprehensive) view of its performance.					
3.2	A construction firm would realize benefits from using the CPMM framework.					
3.3	The framework can be used in the strategy management process of a construction firms.					
3.4	The framework can be used to improve performance of a construction firm.					
3.5	The CPMM framework provides a review mechanism to adapt to changes in strategies and the business environment of a construction firm.					

4. Please place an **X** in the appropriate box that best indicates your level of agreement for each of the statements below in relation to the practicality of the proposed CPMM framework:

4	**Practicality of the proposed CPMM framework**	**Strongly agree** (5)	**Agree** (4)	**Neutral** (3)	**Disagree** (2)	**Strongly disagree** (1)
4.1	The proposed CPMM framework could be implemented within the organization.					
4.2	The proposed CPMM framework would be acceptable in the industry.					
4.3	Other					

Section 3: Elements of Proposed Framework:

5. In your view, is the list of CSFs and performance measures complete?

6. Is there any critical success factors required to be added or deleted? Why the CSF should be added or deleted?

7. Is there any performance measures required to be added or deleted? Why the measures should be added or deleted?

Section 4: General Comments:

8. What, in your view, are some of the key ways to improve the proposed contemporary performance measurement and management (CPMM) framework?

9. What are the potential benefits of using the proposed CPMM Framework?

10. What are the limitations of using the proposed CPMM framework?

11. Is there any additional comment you wish to make on the contemporary performance measurement and management (CPMM) framework and on PMM in the construction industry?

Thank you for participating in the interview.

Appendix I: Ranking of performance measures used by Saint Lucian construction firms

	Ranking of the performance measures				
#	**Perspective**	**Measures**	**Mean**	**STD**	**Ranking**
1	**Project**	Quality of workmanship and product	4.56	0.43	1
1	**Financial**	Cash flow level	4.50	0.12	2
1	**Customer**	Customer satisfaction rating	4.50	0.81	3
1	**Internal business process**	Response time to key quality and/or other business issues	4.47	0.12	4
2	**Financial**	Profit or net profit margin	4.26	0.44	5
2	**Project**	Actual cost vs Budgeted costs	4.26	0.61	6
3	**Project**	Client satisfaction rating of project	4.26	0.66	7
4	**Project**	Time of delivery against agreed standards	4.24	0.48	8
2	**Internal business process**	Processing time	4.21	0.36	9
2	**Customer**	Percentage of repeat business customers	4.18	0.74	10
1	**Leaning & growth**	Percentage of employees using computers in construction	4.12	0.90	11
5	**Project**	Project productivity rate	4.09	0.67	12
2	**Leaning & growth**	Employee satisfaction rating	4.00	0.00	13
6	**Project**	Level of project safety	4.00	0.54	14
1	**Environment & community**	Level of environmental compliance	4.00	0.73	15
7	**Project**	Project profit margin	3.97	0.96	16
1	**Supplier**	Level of supplier's defect-free deliveries	3.94	0.73	17
2	**Environment & community**	Energy consumption	3.94	0.81	18
4	**Environment & community**	Contribution to the local community	3.94	0.91	19
3	**Environment & community**	Number of jobs created	3.94	0.97	20
4	**Customer**	Organization (corporate) image rating	3.91	0.28	21
2	**Supplier**	Percentage of on-time supplier deliveries	3.91	0.56	22
3	**Financial**	Receivables turnover (days)	3.91	0.83	23
4	**Financial**	level of debt (indebtedness)	3.88	0.55	24
5	**Environment & community**	Water consumption	3.88	0.78	25
6	**Environment & community**	Wastage and scrap level	3.88	0.92	26
3	**Leaning & growth**	Competency coverage ratio	3.82	0.95	27
3	**Supplier**	Level of supplier satisfaction	3.76	0.49	28
4	**Leaning & growth**	Level of IT application in construction	3.76	0.60	29
5	**Financial**	Return on Investment	3.74	0.47	30
3	**Internal business process**	Level of defects or errors	3.71	0.52	31
4	**Supplier**	Level of flexibility	3.71	0.53	32
4	**Internal business process**	Construction productivity rate	3.71	0.82	33
5	**Leaning & growth**	Recognizing & rewarding employees for outstanding performance	3.71	0.92	34

3	**Customer**	Customer or client growth	3.62	0.03	35
5	**Internal business process**	Percentage of expenses to total sales (turnover)	3.62	0.80	36
7	**Leaning & growth**	Investment in IT in construction	3.59	0.55	37
5	**Supplier**	Supplier lead time against industry norm	3.59	0.55	38
6	**Leaning & growth**	Employee productivity rate	3.59	0.72	39
5	**Customer**	Number of new customers	3.59	0.84	40
6	**Financial**	Net sales (turnover) growth rate	3.56	0.93	41
6	**Internal business process**	Successful tenders rate	3.56	0.68	42
8	**Leaning & growth**	Employees absenteeism rate	3.53	0.74	43
9	**Leaning & growth**	Number of employee improvement suggestions	3.53	1.02	44
7	**Internal business process**	Risk management responses	3.47	0.27	45
7	**Financial**	Net profit growth rate	3.44	0.80	46
8	**Internal business process**	No. of risk management meetings	3.41	0.54	47
8	**Financial**	Debt ratio	3.41	0.72	48
9	**Financial**	Current ratio	3.35	1.14	49
6	**Customer**	Number of customer improvement suggestions	3.32	0.53	50
7	**Customer**	Number of complaints from customers	3.29	1.25	51
10	**Leaning & growth**	Investment in Knowledge management efforts	3.26	0.72	52
9	**Internal business process**	Safety & health audits	3.26	0.99	53
8	**Customer**	Percentage of market share	3.24	0.28	54
10	**Internal business process**	Risk assessment review	3.24	0.97	55
6	**Supplier**	Number of innovation suggestions from suppliers	3.21	1.09	56
11	**Leaning & growth**	Training hours per employee per year	3.15	0.90	57
12	**Leaning & growth**	Investment in leadership development	3.09	0.52	58
10	**Financial**	Interest coverage ratio	3.03	0.17	59
11	**Internal business process**	Accident rate/level	3.00	0.64	60
13	**Leaning & growth**	% of employee with degrees	2.76	1.24	61
12	**Internal business process**	Time loss to accidents	2.68	0.37	62
13	**Internal business process**	Risk scores for core construction business activities	2.53	0.72	63

Appendix J: Definitions provided to Validation interviewees

Definitions of concepts:

A conceptual framework is a diagram comprising of key concepts or variables and highlighting the relationship among them that underpin a subject matter.

Strategy formulation is the process of establishing the vision, mission, goals, objectives, strategies, plans and policies for an organization in order to monitor and steer its overall direction.

Contemporary performance measurement and management (CPMM) framework consists of both financial and non-financial performance measures across a range of performance perspectives to evaluate performance of an organization. It attempts to link performance measures to the strategy of the organization. It is support by information technology/system.

Performance perspectives dimensions are key business areas of organizational performance. Organizations should therefore develop and define performance measures for their various key business areas.

Critical success factors (CSFs) are important factors, which are considered to be integral to the success of an organization (or a business unit or a project). They must be done well if the organization (business unit or project) is to successfully attain its goals and strategy.

Performance measures or indicators are metrics that capture, measure, evaluate and report organizational performance against defined objectives and targets.

Financial performance measures provide performance information that are expressed in monetary terms.

Non-financial performance measures are measures that provide performance information in non-monetary terms.

PMM framework review involves assessing its existing elements and developing new ones in according to changes in the strategies and the business environment of a construction firm.

Competency coverage ratio is the percentage of necessary competencies or qualified employees of an organization possess to meet its anticipated business needs.